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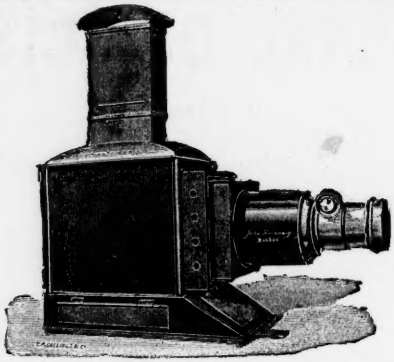

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THE

JOURNAL OF SCIENCE.

FEBRUARY, 1881.

I. THE EARLY PRACTICE OF MEDICINE BY WOMEN.

By Professor H. CARRINGTON BOLTON, Ph.D.,
Of Trinity College, Hartford, Connecticut.

IN attempting to sketch the history of the entrance of women into the medical profession we find the earlier periods obscured by a meagreness of material and a lack of sequence which our superficial researches have failed to supplement.

Isolated cases of gifted women attaining notable surgical skill and successfully pursuing the divine art of healing are recorded at various epochs in the history of the intellectual development of woman, but they occur at long intervals of time and in widely scattered chronicles. In the following pages we have not undertaken to present an exhaustive history or catalogue of female practitioners of medicine; we have simply collected a few scattered notices, and moulded them into an outline to be hereafter filled up by a more competent hand.

These notices refer to the earlier history only, and by earlier history we mean the period prior to the establishment of medical schools for women, and to the present movement for their higher education. From the earliest times women have successfully grappled with a most difficult branch of medical science, gynecology, but long-existing and deep-seated prejudices prevented an extension of their practice, and, save in exceptional cases, they were forbidden both the acquirement of accurate and systematic knowledge and the exercise of their chosen vocation. So long as the practice of medicine formed a part of the priestly functions, as in

ancient Egypt, the crafty guardians of superstition sedulously concealed their superior knowledge from an ignorant and credulous people, and especially from women. Yet the story of the birth of Moses shows that female gynecologists were not unknown to the Egyptians.

At a later period the Greeks thought to add dignity to the practice of medicine by forbidding it to slaves and (forsooth!) to women. During the Middle Ages, when every branch of Science was more or less dishonoured by degrading superstitions, we find women, as well as men, yielding to their influence and exercising the double calling of sorceress and healer of the sick; nor has the intelligence of the common people even in the nineteenth century reached such a height as to render the business of medical clairvoyant nugatory and profitless.

The invention of medicine was almost universally attributed by the ancients to the gods, and it is a curious fact that in both Egyptian and Grecian mythology we find female deities occupying important relations to the healing art. To the Egyptian deity Isis, the wife and sister of Osiris, peculiar medical skill was attributed, and a multitude of diseases were regarded as the effects of her anger. According to tradition she had given unequivocal proof of her power by the restoration of her son Orus to life. She was the reputed discoverer also of several remedies, and even as late as Galen the Materia Medica contained several compounds which bore her name: thus, in the symbolical language of the Egyptian priestly physicians, the vervain was called the "tears of Isis."

According to the annals of Grecian mythology, Hygeia, daughter of Æsculapius, the god of medicine, was worshipped in the temples of Argos as the goddess of health. In art, Hygeia is represented as a virgin wearing an expression of benevolence and kindness, and holding in one hand a serpent which is feeding from a cup in the other. She was regarded as the goddess both of physical and mental health, thereby personifying the aphorism "Mens sana in corpore sano." The Greeks also ascribed medical power to Juno, who, under the name of Lucina, was held to preside over the birth of children; and to Ocyroe, daughter of the Centaur Cheiron, who was renowned for his skill in surgery and medicine. The sorceresses Medea and Circe were said to make use of herbs in their enchantments and for the purpose of counteracting the effects of poisons. These and similar fables probably preserve in allegoric form facts connected with the practice of medicine by women in the remotest antiquity.

The writings of Homer have been examined to ascertain his testimony, but, with the exception of slight reference to woman's part in nursing wounded warriors, he contributes nothing to the subject under consideration.

The learned among the Celts, the Druids, were at the same time judges, legislators, priests, and physicians. By persuading the people that they maintained intimate relations with the gods, they succeeded in imposing their authority on the ignorant masses. "Their wives, who were called *Alraunes*, exercised the calling of sorceresses, causing considerable evil by their witchcraft, but caring for warriors wounded in battle. They gathered those plants to which they attributed magic virtues, and they unravelled dreams." (Dunglison.)

The first female practitioner who received a medical education appears to be Agnodice, a young Athenian woman who lived about 300 B.C. To satisfy her desire for knowledge she disguised herself in male attire, and, braving the fatal results of detection, dared to attend the schools of medicine forbidden to her sex. Among her instructors was numbered Herophilus, the greatest anatomist of antiquity, and the first who dissected human subjects. After completing her studies, Agnodice preserved her disguise and practised her chosen calling in the Grecian capital with great success, giving particular attention to the diseases of her own sex. The physicians of Athens, becoming jealous of Agnodice's great reputation and lucrative practice, summoned her before the Areopagus, and accused her of abusing her trusts in dealing with female patients. To establish her innocence Agnodice disclosed her sex, and her persecutors then accused her of violating the law prohibiting women and slaves from studying medicine, but the wives of the most influential Athenians arose in her defence, and eventually obtained a revocation of the law.

The laws and customs of the Romans, as well as of the Greeks, were antagonistic to the entrance of women into the medical profession, yet Galen, Pliny, and others have preserved the names of a few distinguished in the art of healing:—Phænarete, the mother of Socrates, Olympia of Thebes, Salpe, Sotira, Elephantis, Favilla, Aspasia, and Cleopatra. Of these, details are generally wanting. Scribonius Largus writes of an "honest matron" who cured several epileptic patients by an absurd remedy, and mentions having purchased of a woman a prescription for the cure of cholic, the composition of which she had learned in Africa. Why Aspasia appears in this connection is not perfectly clear;

the talented wife of Pericles, renowned as "a model of female loveliness," was doubtless too involved in affairs of state to undertake the absorbing cares of the medical profession. Cleopatra, the accomplished and luxurious Queen of Egypt, of whom so many marvels are related, is named among those women possessed of medical skill; she is reported to have compounded cosmetics, and to have written on the art of preserving beauty; but this statement is probably no more worthy of credence than that of the infatuated alchemists of the Middle Ages, who would persuade us that Cleopatra was the fortunate possessor of the philosopher's stone and of the universal solvent. In proof of the former statement they point to her personal attractions, unchanged by increasing years, and to her immense wealth; in proof of the latter they rely with confidence on the well-known fable of the solution of the costly pearl at the extravagant banquet to Marc Antony.

In a Roman lady named Fabiola we find an early predecessor of Florence Nightingale. She was of the illustrious house of Fabius, and was celebrated in the fourth century for piety and charity. She is to be held in grateful remembrance as the founder of hospitals in Italy, and she is said to have personally nursed the sick at Ostia. The establishment of hospitals is commonly credited to the Emperor Julian, 362 A.D., with whom Fabiola was contemporary; perhaps she took an active part in the humane movement, and held a position analogous to that of lady manager in modern times.*

Half a century later lived a woman justly distinguished for combining in one person a high degree of female loveliness, womanly virtue, and intellectual strength: though not occupied with the art of healing, we cannot pass in silence the accomplished Hypatia. Born at Alexandria in the latter part of the fourth century, the daughter of Theon, an eminent mathematician and philosopher, she soon excelled her father in these branches of learning. After profiting by profound studies under celebrated masters at Athens and Alexandria, she publicly taught philosophy at both these centres of culture. Gibbon writes of her—"In the bloom of beauty and in the maturity of wisdom, the modest maid refused her lovers and instructed her disciples." On Hypatia's inhuman murder, at the instigation of the jealous Cyril and his fanatical followers, it is not here necessary to dwell.

* Celsus, who wrote in the reign of Augustus (A.D. 1), mentions large hospitals where patients were treated with specific medicines. (Milligan's Ed., p. 14.) Seneca also refers to them as "valetudinaria."

The practice of medicine by women obtained to some extent during the Middle Ages. Under the influence of Mohammedan rule women were placed in excessive isolation, and it is not surprising to find under these circumstances that certain women were skilled in attending to the requirements of their own sex. Thus Albucasis, of Cordova, one of the most skilful surgeons of the twelfth century, secured the services of properly instructed women for assistance in operations on females in which considerations of delicacy intervened. Avicenna, also, writing of remedies for diseases of the eyes, mentions a collyrium compounded by a woman well versed in medical science. On the whole, however, the number of women instructed in medicine among the Arabs was very small, owing possibly to the inferiority to which women were condemned by Eastern usages.

In Christian countries the nuns as well as the priests attended to the healing of the sick as an act of charity and piety. Abélard, in the twelfth century, permitted the practice of surgery to those of the convent of the Paraclete, over which Héloïse presided. The most celebrated of the learned nuns was Hildegarde (A.D. 1098 to 1180), abbess of the convent of Rupertsberg, near Bingen on the Rhine. She compiled a sort of Materia Medica, which comprises a variety of superstitious remedies. Radegonde, of France, the founder of a convent at Poitiers (died 587), the pious ascetic Elizabeth of Hungary (died 1231), Hedwigia, wife of Henry the Bearded, and other women who devoted themselves to the care of the sick, may be properly regarded as praiseworthy exemplars of Christian benevolence rather than educated practitioners of medicine.

In the famous school of medicine established at Salernum by Benedictine monks, in the eleventh century, we find women taking an important part. Ordericus Vitalis, in his "Ecclesiastical History" (written about 1130), relates that an abbot eminent in natural sciences, and especially distinguished in medicine, visited Salernum in the year 1059 for the purpose of discussing medical topics, and found no one erudite enough to reply to his propositions save a certain woman of great learning. This woman he does not name, but she is supposed to be the same as Trotula of Ruggiero, whose reputation at that period was world-wide. At Salernum women were engaged in the preparation of drugs and cosmetics, and in the practice of medicine among persons of both sexes: such were Abella, author of two medical poems; Costanza Calenda, the talented and beautiful

daughter of a skilful physician, under whose instructions she attained to a doctor's degree; Mercuriade, author of several treatises; Rebecca Guarna, Adelmota Maltraversa, and Marguerite of Naples, who obtained royal authority for practising the medical art.—(Beaugrand, in "Dict. Encyc. Sci. Médicales.")

The ancient and honourable universities of Italy were, we believe, the first to recognise the capacity of women to give instruction of a high character. The University of Bologna, founded in 1116, was attended in the year 1250 by ten thousand students, engaged in the study of jurisprudence, of philosophy, and of medicine. "Here was first taught the anatomy of the human frame, the mysteries of galvanic electricity, and later the circulation of the blood." Here, too, were the earliest successful experiments in admitting women to occupy professorial chairs, for a long line of female professors taught in many departments of learning.*

As early as the thirteenth century two women were numbered among the eminent professors of the University of Bologna—Accorsa Accorso and Bettisia Gozzadini; the former held the chair of Philosophy, the latter that of Jurisprudence. In the fourteenth century the lovely and learned Novella d'Andrea, daughter of a distinguished lawyer, often took her father's place in the professorial chair, and instructed his students in law. Of Novella it is reported that she was so beautiful that she lectured behind a curtain, "lest, if her charms were seen, the students should let their young eyes wander over her exquisite features and quite forget their jurisprudence." The rival University of Padua, founded in 1228, had also its female representatives. Of these the most distinguished was Elena Lucrezia Cornaro. This interesting woman was born at Venice, June 5, 1646, and at a very early age exhibited an extraordinary capacity for acquiring languages. She was familiar with French, Spanish, Latin, Greek, and Hebrew, besides her native Italian, and had some acquaintance with Arabic. While endowed by nature with poetical and musical talents, she possessed at the same time great perseverance and capacity for serious studies, and discoursed eloquently on abstruse topics in philosophy, mathematics, astronomy, and theology. At the age of 32 the University of Padua conferred upon her the degree of Doctor of Philosophy. Cornaro seems

* According to Madame Villari, whose papers on the "Learned Women of Bologna" furnish us with many of the succeeding data, there is to the present day no law preventing women from graduating at Italian universities or taking professorial positions.

never to have held any public position, being naturally of a retiring disposition, and moreover exceedingly devoted to the order of St. Benedict. After acquiring a European reputation she died at the comparatively early age of 38 (1684).

The beginning of the following century witnessed the birth of one of the most gifted women the world has ever seen. Laura Caterina Bassi was born at Bologna, October 31, 1711. She was the daughter of a distinguished lawyer and *littérateur*, and at a tender age manifested extraordinary precocity, being able while still a child to translate fluently most difficult Latin and Greek. Encouraged by her father, she pursued her studies under the guidance of eminent masters; she learned physiology and medicine with the erudite physician Gaetano Tacconi, mathematics with Manfredi, and natural philosophy with the disciples of Gassendi, and she astonished these profound philosophers by her talents. Laura Bassi studied for the pure love of knowledge, and had no ambition to seek public honours, but, to gratify the pardonable pride of a father as well as the earnest desire of her instructors, she consented to support a philosophical thesis before a learned audience of professors. This event took place on the 17th of April, 1732, before she had reached the age of 21 years. The occasion was made one of festivity by the whole city, who turned out to do her honour; the assemblage was presided over by two cardinals —Lambertini, afterward Pope Benedict XIV., and Grimaldi. According to custom her thesis was opposed by seven learned men; to these she replied in elegant Latin with great success and amid the applause of the distinguished audience. A month later the degree of Doctor was conferred upon her, and she was honoured by a position in the Faculty of Philosophy. The Senate subsequently bestowed upon her the chair of Physics, and commemorated the event by striking a medal which bore her own portrait. She held the professorship twenty-eight years with marked success, paying particular attention to mathematics and physics, also to *belles-lettres*. Several academies of learning elected her to membership. In 1738 she was married to J. J. Veratti, a physician, and became in the course of time the mother of twelve children. A learned French *littérateur* who visited Bologna in her day thus describes her appearance:— "Laura Bassi has a countenance slightly marked with small-pox, but of a sweet and modest expression; her black eyes are sparkling, yet tranquil, and she is serious and composed in demeanour without affectation or vanity. Her memory is tenacious, her judgment sound, and her

imagination active." She died in the year 1778, at the age of 67.

Laura Bassi does not seem to have pursued medical studies, and certainly never engaged in practice; but any account of the gifted women of Bologna who laboured in this direction would be incomplete without a brief notice of Madame Veratti.

Contemporary with this interesting woman lived another, less gifted but scarcely less renowned. Anna Morandi was born at Bologna five years later than Lauri Bassi, and died four years earlier. She became the wife of Giovanni Manzolini, a poor, hard-working maker of anatomical models. Manzolini was an expert painter and modeller in wax, and was employed by one Lelli to construct a series of anatomical models for the use of the professors in the Institute of Bologna. Anna not only aided her husband, but soon surpassed him in skill, and particularly in that scientific knowledge upon which the success of their joint labours so largely depended. About this time Giovanni Antonio Galli, a skilful surgeon and professor of Gynecology, opened a school of obstetrics in his house, and, encouraged by him, Anna began to lecture on anatomy to private classes. In these lectures she not only imparted with peculiar talent the knowledge derived from her husband, but she also communicated many discoveries made by herself. So great was her skill in all dissections requiring delicacy of touch and minuteness of detail, and so clearly did she demonstrate, both theoretically and practically, the wonderful structure of the human body, that she rapidly acquired a European reputation, and her lecture-room was frequented by students of all countries.

In 1755 Anna Manzolini became a widow, and was left with very slender means of support, but her good qualities raised up friends who secured for her a comfortable subsistence. Though she received tempting offers from other Italian universities, and even from England and Russia, she preferred to remain in her native city, Bologna. Not long after her husband's death she was appointed to the chair of Anatomy in the Bologna Institute.

Anna Morandi-Manzolini enjoys the distinction of having been the first "to reproduce in wax such minute portions of the human body as the capillary vessels and the nerves." Her collection of anatomical models, still to be seen at the Institute of Science, bears silent testimony to her remarkable skill and accurate knowledge. "Her lectures were delivered in the fragrant cedar hall which is one of the

modern sights of Bologna, and in which Lelli's anatomical wooden figures supporting the canopy over the professorial chair attract general admiration." In the anatomical gallery of the university is to be seen her portrait in wax, modelled by herself at the request of many admiring friends. Anna Manzolini closed a laborious and honoured life in 1774, at the age of 58 years.

The city of Bologna, in the middle of the eighteenth century, saw three gifted women simultaneously occupying seats in the faculty of its ancient university. Besides Laura Bassi and Anna Morandi-Manzolini, of whom we have briefly spoken, Maria Gaetano Agnesi was equally distinguished.

Maria Agnesi was born at Milan, March 16, 1718. At an early age she manifested a remarkable facility for acquiring languages, and when only 20 years old was able to discourse in French, Spanish, German, Greek, and Hebrew, besides her mother-tongue. She displayed marked ability also in philosophy and mathematics, and while still young sustained one hundred and ninety-one theses, which were afterward printed under the title "Propisitiones Philosophicæ." In 1748 Agnesi published a treatise on algebra, including the differential and integral calculus, in which she displayed wonderful judgment and erudition. This work ("Instituzioni Analitichi") was afterward translated by Colson, the Lucasian Professor of Mathematics at Cambridge, and was used by the students of that university. In 1750 her father, who was Professor of Mathematics at the University of Bologna, fell sick, and she obtained permission of the good Pope Benedictus XIV. to occupy her father's chair. In person Agnesi is said to have been beautiful, modest, and of pleasing manners. Her severe studies overtaxed her delicate frame, and shortly after she renounced the world and took refuge among the Blue Nuns at Bologna. In this nunnery she lived several years a devotee and an invalid; she died in 1799.

While Laura Bassi taught physics, Anna Morandi-Manzolini anatomy, and Maria Agnesi mathematics, in the Bolognese University, we might naturally expect the gentler sex to avail themselves of the opportunity of studying under their sisters' instructions. And such, in fact, was the case: the names of some of these students are recorded by the historian, many of whom received the degrees of Doctor of Philosophy and Doctor of Medicine. In 1799 Doctor Maria delle Donne appears as Professor of Medicine and Obstetrics; Clotilda Tambroni was Professor of the Greek

Language and Literature, from 1793 to 1808. To these names should be added those of Novella Calderini, Maddalena Buonsignori, Dorotea Bocchi (who was both doctor and professor) Christina Roccati, Ph.D., Zaffira Ferretti, M.D., Maria Sega, M.D., and numerous graduates of Padua, Pavia, Ferrara, and other Italian universities.

Leaving the Italian peninsula, which was so productive of remarkable personages, we will briefly examine the position of women practitioners of medicine in other parts of Europe.

Beaugrand states that the most ancient document extant relative to the organisation of surgery in France forbids the practice of surgeons and of *female* surgeons who have failed to pass a satisfactory examination before the proper authorities. This paper bears the date 1311. References to female surgeons appear again in an edict of King John in 1352. From these documents it appears that women exercised the function of surgeon under legal authority. At a somewhat later period we find the calling of physician followed by women in Spain, Germany, and England.

In Spain, the Universities of Cordova, Salamanca, and Alcala honoured many women with doctors' degrees. We note also the appearance at Madrid, in 1587, of a learned medical work entitled "Nueva Filosofia de la Naturaleza del Hombre," and published over the name Olivia del Sabuco. Of this person, however, nothing whatever is certainly known, and it has been conjectured that the name Olivia was a pseudonym assumed by some eminent physician.

In Germany many women cultivated medical science: Barbara Weintrauben was an author of no great merit; the Duchess Eleanor of Troppau, Catharina Tissheim, Helena Aldegunde, and Frau Erxleben are deserving passing notice. The last-mentioned was one of the most successful female practitioners of the last century. Her maiden name was Dorothea Leporin, but she is best known as Frau Erxleben. Fräulein Leporin pursued her medical studies at the University of Halle, and obtained a diploma in 1734. She settled in the little town of Quedlinburg, at the foot of the Hartz Mountains, became the wife of the rector of the Church of St. Nicholas in the same place, industriously practised her profession, and became eminent for her skill and learning. Her son, J. C. P. Erxleben, inherited from his mother a love of scientific pursuits, and became a distinguished naturalist and professor in the University of Göttingen.

In England, Anna Wolley and Elizabeth of Kent were

occupied with the preparation of drugs as early as the seventeenth century, and both published works on medical subjects.

In this hasty and superficial sketch of the history of the early practice of medicine by women we would not be true to the facts if we omitted mention of certain ignorant and vulgar women who assumed medical knowledge and medical skill to impose upon a too credulous public. That avaricious women, fond of notoriety and careless of their reputation, should imitate the methods adopted in every age by unprincipled men, is not surprising, though it may be mortifying. To this class belonged Louise Bourgeois, nurse to Marie de Medici, the Queen of Henry IV. of France: though an ignorant charlatan, she acquired extraordinary influence over her royal patroness, and her career abounds in curious eventful episodes. She was the author of several medical treatises on the diseases of women, one of which was published at Paris in 1617.

A century later another female practitioner flourished, of whom women have no reason to be proud. In the year 1738 Mrs. Joanna Stephens proclaimed in London that she had discovered a sovereign remedy for a painful disease. Notwithstanding her gross ignorance and vulgar demeanour she secured a large circle of patients from among the upper and wealthy classes, and, after enriching herself by enormous fees drawn from their credulity, she proposed to make her medical discovery public in consideration of the modest sum of twenty-five thousand dollars. A subscription was started for this purpose and enthusiastically taken up; the clergy, lords, and ladies, with an inexplicable infatuation, hastened to add their names to the list of subscribers. Failing, however, to raise so large a sum of money, Mrs. Stephens's friends obtained a grant of the desired amount from Parliament. The certificate testifying to the "utility, efficacy, and dissolving power of the medicines," bears the date March 5, 1739, and is signed by twenty justices. These dearly purchased remedies were three in number, "a powder, a decoction, and pills." The powder consisted of calcined egg-shells and snails; the decoction was a disgusting mixture of herbs, soap, and honey, boiled in water; and the pills were made of "calcined wild-carrot seeds, burdock seeds, ashen keys, hips, and haws—all burned to a blackness —soap, and honey."

Contemporary with Mrs. Stephens lived another impostor, Mrs. Mapp, sometimes known as "Crazy Sally of Epsom," and described as an "enormously fat, ugly creature,

accustomed to frequent country fairs, about which she loved to reel, screaming, abusive, and in a state of beastly intoxication." This attractive lady was by profession a bone-setter, and was patronised by patients of rank and wealth, who sought her charily bestowed favours with ill-disguised contempt of her person. The town authorities of Epsom greatly esteemed Mrs. Mapp, or perhaps we should say highly valued the benefit the town derived from the influx of wealthy patients, and they offered her the sum of five hundred dollars per annum if she would continue to reside in the town.

The first half of this century has witnessed the career of a few women eminent in the art of healing. In France Madame La Chapelle had an extensive gynecological practice, and Madame Boivin attained to such distinction that she was honoured with the degree of Doctor of Medicine by the University of Marburg. In Germany Charlotte Heidenreich and Frau Heiland, her step-mother, were similarly honoured with doctors' diplomas.

It is the glory of America that she is distinguished above all countries not only as the cradle of liberty, but also as the foster-mother of the intellectual advancement of women. Yet this has not always been the case: in the early chronicles of the colonists (themselves refugees from persecution) we find, strangely enough, many laws of an exacting and repressive character, some of which were aimed directly at the ambition and zeal of women. In the famous Blue Laws of Connecticut the following curious entry occurs under the date of March, 1638:—" Jane Hawkins, the wife of Richard Hawkins, had liberty till the beginning of the third month called May, and the magistrates (if shee did not depart before) to dispose of her; and in the mean time shee is not to meddle in surgery or phisick, drinks, plaisters, or oyles, nor to question matters of religion except with the Elders for satisfaction."—(" True Blue Laws of Connecticut," by J. H. Trumbull, 1876.)

A hundred and forty years later we find marked progress in liberality in the State of Connecticut. As early as 1773, in the town of Torrington, Litchfield County, two women were greatly honoured and much sought for on account of their remarkable skill as accoucheuses. The first of these, Mrs. Jacob Johnson, to quote the historian of Torrington (Rev. Samuel Orcutt), was as thoroughly known and trusted in her profession as any physician that was ever in the town. " She rode on horseback, keeping a horse for the special purpose, and travelling night and day, far and near,"

to meet her engagements. "She kept an account of the number of cases she had, and the success of the patients, and the new-comers; and of these last there is at least one living in the town. In the midst of her usefulness she was removed by death, and it became a great inquiry, 'Who will take the place of Granny Johnson?'" This question was answered more successfully than anticipated in the person of Mrs. Huldah Beach, daughter of Aaron Loomis, jun. Mrs. Beach became as celebrated in her calling as Granny Johnson, and continued to attend to her professional duties until an advanced age. She was a woman of remarkably fine personal appearance and decided dignity of carriage, yet marked kindliness of manner. Her intellectual strength and ability was perceptible to every one, and she in consequence commanded great respect in all classes of society, and won the confidence of the people so that but few calls were made on any other physician in her specialty, on the western side of the town. She also rode as far as Winchester, Goshen, and Litchfield.

Dr. Orcutt, whose "History of Torrington" has furnished us with these particulars, remarks in this connection—"Many have imagined that, in the practice of medicine by women, a new era has arrived, but in this there is only a 'restoration of the lost arts.'"

Our allotted task is completed, yet we cannot close this address without a brief survey of the present period, in which the facilities afforded women in all branches of learning contrast strongly with the impediments and obstacles formerly well nigh insurmountable.

Women desirous of acquiring medical knowledge are no longer obliged to disguise themselves in male attire like Agnodice the Athenian, nor are practitioners liable to suffer the penalties of the law for their works of benevolence and charity. In 1880 the young woman with aspirations for intellectual culture finds open to her such excellent training-schools as Holyoke, Wells, and Rutgers,—such noble institutions as Vassar, Smith, and Wellesley. Does she not shrink from contact with her brothers, she may gain entrance into many universities, either expressly founded in a liberal spirit,—as Oberlin, Cornell, and Ann Arbor,—or which have yielded to the steady pressure of public opinion, and now open their doors more or less widely to the gentler sex. To enumerate the latter would be tedious and unprofitable; suffice it to say that even venerable and aristocratic Harvard has lately joined the number, and our own Columbia, should her President's views prevail, will not be slow to follow.

The young woman who seeks intellectual training of a more technical character, with a view to adopting a professional career, will find many avenues opening up with constantly increasing privileges and facilties. The student in art, thanks to the philanthropy of our venerable citizen, Peter Cooper, can, without incurring expense, acquire a knowledge of designing or of wood-engraving which will hardly fail to secure for her a competence. The student in biology will receive her share of attention at a summer school of science on our Atlantic seaboard, or held in connection with some enterprising institution of learning. The student in pharmacy and chemistry can conduct her researches on an equality with men, or, if she prefer, in laboratories controlled and officered in large part by women themselves.

The student in medicine now gains access to medical colleges in nearly every State in the Union, and the legitimacy of her pursuit as well as her ability to grapple with it gain increasing advocates. "She is no longer regarded as too good and too stupid to study medicine." The candidate for medical honours also finds in Boston, Philadelphia, New York, and Chicago, well-appointed schools of medicine especially adapted to her needs, with corps of trained and sympathising instructors ready to lend a helping hand.

Looking across the Atlantic, we find countries so lately intolerant of the intellectual advancement of woman at last yielding, not always gracefully, to the inevitable. The little republic of Switzerland, and the mighty empire of Russia have for many years manifested practical sympathy with the cause; and now, slowly yet surely, conservative England begins to recognise the fact that the Anglo-Saxon race, with its boasted love of liberty, has been neglectful of its duty to womankind.

To trace any more fully the history of the recent period does not fall within the province of our address; we look to the pioneers of this movement who are still with us, for an exhaustive and authentic record such as participators and eye-witnesses alone can supply.

II. LIFE AND ITS BASIS.

By J. H. Barker, M.A.

Part II.—*Animal Life.*

THERE is a somewhat ambiguous expression of recent origin, and adopted by some writers of high standing in science, viz., "The cosmical life of the Universe." And to this hypothetical source we are invited to trace all life, whether on our own or other worlds. It must be presumed that this 'cosmical life' is some universal principle or power manifesting itself in an unceasing energy and possessed of boundless resources and consummate skill,—if it is the originator of all the fair and wonderful world of life which we see around us, and of which we ourselves, as human beings, form the highest and noblest part. Moreover, this same power or force is regarded by some modern authorities as identical with those mysterious forces which are conspicuous everywhere in the inorganic world, and producing its ceaseless changes and processes. I confess I see no reason to deny or to doubt the reality of such a general force or power.

Professor Haeckel of Jena is a well-known advocate of this theory, and in vol. i. p. 331 of his "History of Creation," he maintains the identity of the inorganic and vital forces, as exhibited in the formation of crystals on the one hand, and living things on the other. But, he adds, with much candour, "The *ultimate causes*, it is true, remain *in both cases*" (the *italics* are his own) "concealed from us." These *ultimate causes*, however, comprise the gist of the whole question. Experimental philosophy may fail to find them, but inductive philosophy clearly discerns and gladly recognises them.

It might appear at first sight the most natural course when treating of the manifestation of life in the animal world, that we should start with the simplest, or as they are generally called, the elementary forms. But as we cannot prove, and in many cases can scarcely infer, any distinction between animal and vegetable organisms of this low kind, it will be better to endeavour to estimate this distinction as it is exhibited in the higher and more complicated organisms.

Let us, then, first notice the indisputable fact, that the

vast majority of the living beings of this order, manifest the possession of *volition* as individuals. This faculty of *will*, if it actually exists, proves the presence of something distinct from, and superior to, matter. And when, in addition to this, an animal shows by its actions that it has the power of *thinking*, of reflecting, of comparing, selecting, calculating (with accuracy within certain limits); and still more when it exhibits natural or acquired sagacity and discernment, observation and imitation; and above all, when it manifests *moral* qualities, even of a high order, such as unswerving fidelity and devoted affection, of gratitude and sympathy, as well as the more ordinary sentiments of fear, jealousy, &c., or of cool, deliberate, and long-cherished revenge for insults or injuries;—what, I ask, are these qualities, so familiar to us all, and especially to students of natural history? They are not qualities of *matter*, nor even of *living* matter, or they would be exhibited by plants and trees as well as animals. The tempers and dispositions of individual animals can seldom be traced with any probability to mere bodily organization, any more than in the human race. In short, innumerable qualities exclusively mental are manifestly possessed by animals, from the 'half-reasoning' elephant down to the ant, which is held up by the Wise Man as a pattern of industry and prudence to the careless and improvident sons of men. It may be pertinent here to remark that, whether we measure the psychical force in the lower animals by the intelligence they manifest, or by the physical strength they can put forth *at will*, no correspondence has been proved to exist between it and the magnitude of their bodily frame, nor yet in the proportion which their nervous system bears to their bodies. They are two incommensurable quantities.

It is true, that as we descend in the artificially constructed scale of animated beings, our means of tracing their mental faculties continually diminish, though this does not disprove their existence. So, likewise. the evidence of the existence of individual volition becomes less and less distinct, and seems at length to vanish altogether; or, perhaps, we should rather say, appears to merge into some other form of force. Nevertheless, volition, as evidenced in voluntary motion, seems to be the best criterion we possess, in the failure of the old tests afforded by organic chemistry, of the difference between a plant and an animal. The distinction is a real one, although we may neither be able to define its lower limit, nor to say at what precise stage in the life-history of each individual, volition commences.

But volition being evident, the next question is, To what

does it properly belong? What is the being which exerts it? As it cannot be matter, which is, *per se*, inert, it must be some active principle. And here we enter upon the domain of psychology. Such a principle has been actually recognised in all ages; it was called by the Hebrews '*nephesh*,' by the Greeks '*psyche*,' by the Latins '*anima*,' and perhaps our English word '*soul*' (though doubtless used also in other senses) comes nearest to it. The Latin word 'anima' is, I think, the most appropriate, on account of its being the root of *animal*, *animate*, and their derivatives, besides its allowing the easier use of the plural noun. I therefore ask my readers' permission to employ it here in preference to 'psyche.'

As to the ultimate nature of this '*anima*,' all we can do is to compare it to our own thinking entity; with respect to which we have most important additional evidence, viz., an intuitive and all but irresistible conviction that it is something of a very different nature from the body, and non-material. Moreover, it is as really a separate being as the body which it animates; and in whatever sense the body has a *unity*, the '*anima*' must also be called *one*. As we descend in the scale of organisms, we meet with an arrangement which appears to indicate a kind of corporate life, which some have likened to a republic of human beings. Is it not possible, however, that in such cases the 'anima' may be single, seeing that in the higher animals the 'anima,' though single, extends through and acts upon a multitude of different, though associated organs?

Let us next enquire into the *duration* of these 'animæ.' In this matter we must invert the order of time, and consider its termination first. Is what we call the death of an animal the end also of the existence of its 'anima?' In the total absence of even a probability of their existence subsequent to the cessation of vital action, and the disintegration of their bodily frames, we are clearly justified in asserting that the 'anima' then ceases to exist; that its existence is more or less a transient one. No reason can be given why such transient entities should not be created, for the *length* of their existence must be simply dependent on the power which calls them into being.

The 'anima,' then, in living animals is an entity endowed with *will*, though human observation may not, in every case, be able to detect its working.

We may now advert to the important but very obscure question of its origin. Is the existence of the non-material 'anima' coeval and coincident with the formation of the

germinal cell,—that mystery of mysteries, as the Duke of Argyll rightly terms it, the nucleated cell on which the future organism is built up? Or, to put it in another form, Is the 'anima' identical with the life of that cell and of those which are added to it in the process of growth? and is it, therefore, virtually an aggregation of such *lives?* The notion appears to be inconsistent with the essential unity of the animal mind, for the living state of those component cells is perpetually ceasing, upon their becoming 'formed matter,' and they are also for ever leaving the body and being replaced by new cells. I therefore contend that the life of the 'anima' is not identical with this cellular vitality in animal organisms. The 'anima' is, of course *connected* with those living cells, and this connection is made dependent to a great extent upon certain conditions, which we call health or disease, of those cells. Yet the 'anima' does not depart when a small portion of blood is shed, although its corpuscles possessed this cellular life. Nor, on the other hand, does the cellular vitality instantly cease with the death of the organism as a whole. As their termination therefore is not absolutely contemporaneous, so neither need their commencement be so: that is, the union of the 'anima' with the embryo may take place at any period of utero-gestation. Whenever it does occur, at that moment it becomes a separate, or rather a distinct, individual.

But *whence* this 'anima'? Is it really to be considered a 'detached portion' of the parental 'anima'? or is it an actual creation? If the noble author above quoted is justified in seeing in the nucleated cell which is the germ of the future animal (see Art. in "Contemporary Review") "the great work of creation," much more may the imparting of that 'anima' which constitutes the living creature itself, be properly so designated.

If we suppose the material organism to be formed from the substance of the parent animal, conveyed to its destined point by the blood, this would not be creation, but formation out of pre-existing matter. But the giving of existence to a new 'anima' may be rightly so termed; and it must therefore be conceded, that this is the direct act of the Creator. This union then, however and whenever made, is the conferring of *life* in the higher sense; it is the making not merely a living atom of protoplasm, but a living being.

But the Creator of the 'soul' is at the same time forming —building up—its habitation; at first within special organs appropriated to that work in the body of the parent animal; and after its birth into the outer world, the process is con-

tinued by direct and ordinary nutrition. In both these stages of its existence, the method of procedure is such as to evolve, *gradatim et seriatim*, an organism closely resembling that of the parent. It is no doubt true, that in this evolution the embryo passes in succession through forms which are observed to be permanent in lower animals; but this only proves the unity of the author and the unity of his plans: there is no chance of random processes. In a few exceptional cases the process is interrupted, and stops short of completion: but our ignorance of the reason for such exceptions is far from justifying a doubt, either of the power or wisdom of the Maker of them. He, having previously bestowed on the parent an 'anima' and volition, may allow that *will* and its results, to affect the process of organization in its body, so as to cause what physiology designates 'abortions,' or 'abortive organs.' And even if it can be shown that such variations are continued for one or more successive generations, this is a very slender ground for the extravagant notion of some naturalists, that each organ has its own *germ*, which is transmitted from generation to generation; or the still more unintelligible idea of involved germs; a theory which sees all its future progeny in a single seed or in a simple molecule of protoplasm.

The number of these 'animæ' must of course be indefinitely great, and their variety hardly less so. For not only do they differ in different species, but in the individuals of each species. The variety is fully as great as that of the bodies they inhabit. But this is a characteristic of the works of Nature; while a grand *unity* runs through all, they are as far as possible from presenting a dull *uniformity*. We may almost say that the Great Ruler of Nature seems to delight in displaying before His rational creatures, the exuberance of infinite resource, in the diversity of His productions.

The hypothesis, however, of the independent origin of individual animal souls, now proposed, seems to contradict the received doctrine of heredity, which regards the '*anima*' as *derived* from that of the parent animal. Let us then consider this point more closely. Little as we know of the essential nature of our own minds (or souls) their individual unity is absolutely certain, as also their non-materiality. They cannot therefore be said to have parts, or to be discerptible. Hence the derivation of one soul from another cannot be taken to mean the detachment of a portion of one soul to form another. Whatever connection then may be predicated between the '*animæ*' of parent and offspring, it can only be

one *established at the time* by the power which is carrying on the process. But this is the same thing as giving existence to a new being, *i.e., creation.* Further, in the case of ordinary or dual generation, the 'anima' of the offspring would on the above supposition, consist of a union of the 'animæ' of both parents; and this complication would, of course, be multiplied in geometrical progression at every step we take backward among the progenitors. On these grounds, therefore, I cannot accept the common view on this subject; and must fall back on the far simpler theory, that the 'anima' is, as the Scriptures represent it to be, a direct product of creative power. And this applies equally to man and to beast; in short, to the whole animal world. The special similarities of *bodily* form and organic character, although not always regular, may well be supposed to have a *material* connection with those of the parent animals; in fact, this is the law or rule adopted by the Creator; and if he applies the same general rule to the '*anima*' and yet allows corporeal and external influences to modify its character,—this appears to afford an adequate explanation of the principal phenomena of heredity. The difficulties in the path of those who are determined to reduce these obscure phenomena to the domain of *physical law*, are well illustrated by the scheme of M. Haeckel, who invents eight or ten different *laws* of inheritance, some diametrically opposed to others. He seems to make a new *law*, to account for every difficulty. (See History of Creation," vol. i., ch. viii. ix.)

But this, like many other lines of thought, has its highest interest, as well as its highest development, in the human race. Upon the almost boundless subject, however, of human psychology, I cannot pretend or indeed presume to enter, except as to its most elementary principles. The existence of the human soul or living 'anima,' its distinctness from the body, and its non-material nature, however intimate are its present relations with its corporeity, are here assumed. I may go a step further, and maintain—with the writer of the interesting article in the last number of this Journal upon Comparative Psychology,—that the human 'psyche' is of the same *order* of entities as that of the lower animals. In that respect man is an animal too, and his body is animated by a non-material essence similar, however superior in intellectual and moral powers, to theirs. But similarity is not identity of nature: and I am very far from believing that any close bond of union exists between them, than that they are made by the same great Power, and, in that sense have the same origin.

The special subject before us, however, at present, is *life*, as possessed by man. No one can doubt that in all its main features our corporeal life is identical with that of the lower animals, and that it is subject essentially to the same conditions. And as in their case, so in that of the human organism, I conceive it is absolutely necessary to maintain the distinction between the vitality of the *bioplast*, whether connected with the more solid tissues, or floating in the fluids of the body, and the *life* of the *whole organism*. It is to this latter state that we refer when we speak of 'life and death' as regards any individual human being. The necessity of this distinction will be apparent, when we consider the experiments which have been made with such success, in transfusing a part of the living blood of one man into the veins of another, who by disease or loss of blood, was in danger of dying. No one can imagine that the blood corpuscles thus introduced into the failing body of the one person, transported any part of the 'anima' of the other into his body. If we regard, as we must do, the living being, or 'anima,' as one and indiscerptible, the idea of such a transfer, which leaves the person who parts with his blood, in full possession of life and soul, is entirely inadmissible. It follows, therefore, that whatever connexion may exist between the two kinds of life, they cannot properly be called identical. The same inference is to be drawn from the fact before alluded to in regard to animals, that the cessation of vitality in the organs of the body (*e.g.* the contractility of the muscular fibre), is not coincident with the departure of the aggregate life of the system. On the other hand, the corpuscular life may cease, at least partially, in almost any part of the body, while the union of the soul continues intact.

It is as impossible to say what amount of corpuscular vitality is adequate to maintain this union between soul and body, as it is to describe the nature of that union. It may differ, not only in every animal species, but in every individual, and with every period of life. But the fact of some mutual dependence is obvious. The former state is probably of the same nature as that which we see manifested in vegetation, and which predominates in the 'Protista:' the direct acting cause of which is, according to the present theory, the Supreme Will of the Deity.

But the *life* or living state of the whole human body is the union of the 'anima' with the corporeal organism. I suppose this 'anima,' though of the same *order* of being as those of the brutes, yet to constitute a distinct *class*, endowed with far higher prerogatives and capacities, and destined by

its Maker, not for a transient, but for an eternal existence. Into this subject, however, I do not propose further to enter at present. My next step is to enquire whether there appears to exist any material link between body and soul, which is essential to the living state, and which is common to man and other animals.

It is the general belief of physiologists, that in the animal nervous system there exists a fluid, or influence, of a nature closely allied to voltaic electricity, as evidenced by a number of well-known experiments. The human brain is therefore often spoken of as a *living voltaic battery*, and the nerves are compared to the metallic electrodes. It is certain, moreover, that a continuous supply of this nerve influence, is essential both to sensation, and to voluntary, indeed to *all* muscular action. The living being holds converse with external objects, and especially with its fellow creatures, by means of its five senses, at the special seats of which it must be regarded as locally present, to receive and interpret the meaning of the impressions conveyed from outward objects. Now with respect to two of our senses at least, we know that the impression is made by vibratory and undulatory motions in circumambient media, causing corresponding motions in the nerves; those in the æther being transferred to the optic, and those in the air, liquids, and solids, to the auditory nerves. It may be asked then with reference to vision, whether the motion which was unquestionably in the æther suffused through the air in external contact with the cornea of the eye, actually penetrates the clear structures of that organ? According to the corpuscular theory of light, it would be so; but the wave theory only admits the propagation of *motion in æther*. Then the æther must also permeate the ball of the eye, and the ray of light *in* the eye consist of undulations in that interfused æther. May we not then reasonably suppose that this æther meets at the retina with a medium of its own nature permeating and acting upon the expanded nerve-tissue, and taking up its vibrations? The nerve-fluid, however, is not the percipient being, it is but its servant, however indispensable, even as the nervous system and the body as a whole, are. And this seems to indicate such a special connection with the *mind* or *soul*, *i.e.*, the living '*ego*,' that it may be properly termed the *link* between soul and body.

The fact that this æthereal nerve-fluid is also essential to muscular contractility, and so to voluntary motion, offers additional evidence of the truth of this view of the matter. Moreover the necessity for the presence of some degree at

least of heat (another form of æther-motion) to vital functions, and indeed to the continuance of life itself, seems to prove the presence of some form of æther in the nervous system, as well as in every other part of the living body. In applying the term æthereal to the nerve-fluid I do not mean that it is absolutely identical with the free ether of space. But may it not well be, that the æther which undoubtedly exists all around us, may be modified in its qualities by being taken into combination with that wonderful organic product, the nervous tissue? May it not be one of the functions of the brain and of other ganglionic centres to draw from the air, through the aëration of the blood, constant supplies of this vital element?

The blood is no doubt the *life* of the corporeal system, and that in more senses than one. And it is so in a specially important sense, if one of its chief functions is to *distil*, as it were, from the air we breathe, and store up in the brain, that empyreal form of matter, whose activities are requisite to enable the nerves both of sensation and volition to fulfil their varied functions. And in connection with this subject, is it not possible, nay probable, that many of the perplexing but indisputable facts of *Mesmerism* may find a solution, in the action of a strong will upon the nerve-fluid, and by the medium of the æther combined with the air, acting upon the nervous and muscular system of the person subjected to it?

Human 'life' then in the higher sense, is the continued union of soul and body by its æthereal link, and death is the cessation of that union. So far the man and the brute are alike, and perhaps the correlation may be extended one step further, to include the phenomena of *dormant* life; although in some obscure cases it may be wholly impossible to decide whether vitality has finally ceased, until disintegration of the organism has taken place; but here the similarity ends. In the case of all animals except man, the cessation of the life is the end of the existence of their 'anima.' The beasts *perish*—cease to exist. The purposes of their creation have been fulfilled, and they are no more.

Not so, however, in respect to man. To him physical death is that of the body only. As regards *his* 'anima' death is its separation from the gross corporeity which had been in a state of ceaseless flux from the first, and its entrance upon a fresh stage of existence. Into this new condition, it may, and I believe will, enter with the full consciousness of its own existence; and associated with that æthereal substance which in this world constituted the mys-

terious link between it and the body, and will thenceforward be the vehicle of the soul in its new condition. And thus will, we may suppose, be maintained the continuity of material conscious existence. For I regard it in the light of a physical necessity, that a created mind should have some species of embodiment *during its whole existence.* The limitation of mind by material corporeity, seems to be the only possible mode of giving it either individuality or locality. Not that such a state of non-corporeity is an abstract impossibility, but that it seems inconsistent with all we know of the nature and relations of the two entities. The beings we ordinarily speak of as *spirits*, whether they have once dwelt in earthly bodies or not, have probably as real a corporeity as we have, although æthereal in its nature, and therefore ordinarily invisible to us. We must, however, remember that æther itself, the very *matter of light*, is absolutely invisible to us, except it be in a certain definite kind of motion.

I may further observe that it is quite as conceivable that a living being should be embodied in the æthereal as in the more concrete and solid forms of matter. Such a transformation, then, may be in store for the human family, as the late Isaac Taylor shows to be probable on the highest philosophical grounds (see his "Physical Theory of Another Life," *passim.*)

According to our present theory, therefore, matter in some form or other, is the actual *basis* of life, and that probably everywhere in the physical universe. And the only cause and reason of this is, that it seemed good to Him who is the first and last cause of all existences, natural or spiritual.

Of the essence of matter we are, in our present state, profoundly ignorant; we only know some of its effects or properties. But whether it consists of the corpuscles of a Newton, or the fire-mist of a Laplace, the atoms of a Dalton, or the infinite centres of force contended for by a Berkeley or a Boscovich, one thing is certain,—that there is behind and beyond, beneath and above, yea *in* all matter, visible or invisible, known or unknown, a supreme intelligent Being, "the Father of lights," the Maker, Upholder, and Ruler of all, and the ever-living Source of all life.

To sum up briefly the whole subject, I regard terrestrial "life," whether animal or vegetable, not as a distinct *entity*, but *as a temporary condition of certain peculiar kinds of matter*, the efficient cause of which condition is the will of the Supreme, incessantly working as an Omnipresent Being in forming and maintaining living things; chiefly by means of æthereal forms of matter, which are put into various

modes and degrees of motion by the same Power; that some of these activities in the æther are identical with what are known as "the physical and cosmical *forces*" of nature, which as respects their *origin* are not to be distinguished from the vital activities in the molecules of living things:—that this kind of life is simply the continuance of that action in organised matter, and the death of such molecules is the cessation at any point of that action. But in the animal kingdom there is an additional created entity (here designated the 'anima') situated in two terrestrial classes, and united to the corporeal organism as a whole, by a special form of æther in the nerves; that this union while it subsists, constitutes animal life in the usual sense of the term, and that the termination of that union is the death of the whole organism; that the two classes of 'anima' are distinguished from each other by various qualities and capacities, but chiefly by the fact, that the lower class is formed only for a transient existence, which ends with their bodily life, while the human soul is destined for an eternal duration in a future state; and that its natural death is only the separation of the psychical and æthereal parts from the corruptible materials which constituted the soul's embodiment in the first stage of its existence.

I may add, in conclusion, that even if the foregoing theory be discarded and 'life' be regarded as a separate entity, we should still be compelled, with the authors of "The Unseen Universe," to recognise the existence and omnipresence of a great 'Lord and Giver of Life'—the Third Person of the Christian Trinity.

[ERRATA (Part I.).—At page 3, line 10, *for* "only" *read* "chiefly." Page 6, line 14, *for* "speciea' *read* "species." Page 8, line 10, *for* "arcuna" *read* "arcana;" line 30, *for* "had" *read* "to."]

III. THE FORMATIVE POWER IN NATURE.

By Sidney Billing.

WHATEVER be the origin of nature, analogy shows that there necessarily must have been an antecedent to all nature, as we know it, a formative principle. This principle, or all reasoning on that we know and see is ineffective, must be the consequence of a direct purpose, as we find all forms, inorganic and organic, coalesce so as to constitute an homogeneity. When purpose is denied to the formative powers by which nature was builded the result would be confusion, *i.e.*, we should have to fall back upon an accidental agglomeration of substances. Nowhere in nature do we find any warrant for such an assumption, and in nature, as we know it, an impossibility, for a repetition of accidents would never conform in orderly arrangement. Nature works through affinities, producing a continual range of effects proceeding from a primitive cause; it selects the materials fitted for the particular purpose, dispersing those unfitted, to form new combinations. If we find nothing else in nature we find order as an outcome of the perfect adaptation of diversified parts to produce a given result. Whatever the formative principle we see in nature may be, whatever it may be called, God or monism, or any other materialistic name, it is the developing power, or purpose resulting in effects, and necessarily there mu t have existed with it a maintaining power. Whatever thes power or cause it is impossible to ignore a cause,* and whether the cause be deistic, natural, or monistic we arrive at an antecedent something, possessing an intelligence only equalled by its power, by and through which the phenomena of nature arose; and further, whatever this cause, intelligence, or power, it worked out its details by progressive steps.

What is the teaching of geology and palæontology? That each of its vast eras, stretching back in their periods to such immensities that the human mind never really comprehends the interval, not numbered by thousands or millions of years, but by millions of millions, and perhaps even a higher term. Each of these eras presents different stratifications and forms, which stratifications could only have arisen from a solidification of the gaseous substance, which in amalgamation we term the ether. The earth's crust lies in strata, its grandest

* Haeckel, stout an upholder as he is of monism, admits a cause, *vide*, "History of Creation."

divisions are the *primary* or Palæozoic, the *secondary* or Mesozoic, the *tertiary* or Cainozoic, ending with the *post-tertiary* or *Neozoic*. These eras are divided and sub-divided.* No naturalist will deny that the primary stratification differs from the post-tertiary, or to speak more definitely, the Laurentian from the Diluvium. From the Laurentian to the Diluvium there is a regular series of stratifications and deposits, with gradations of formations, lower types by development becoming that which we know as the existing flora and fauna of the earth, and these gradations it is fair to say, progressed as the atmospheric structure, so to speak, was ameliorated. We may call all this mechanical or monistic; the gradation of forms, discerned and descanted on by the Palæontologist, shows that there are no hap-hazards or accidents here; through the successions there is arrangement and order, and this brings us face to face with a formative intelligence and purpose so large in character that the human mind fails steadily to hold up the vision for its contemplation.

When the delicacy, variety, and complexity of animate forms are considered, whether it be the Globigerina with its delicate spines, the Foraminifera with its wondrous mansion, the star fish with its ingenious and peculiar powers of locomotion, the Dinotherium with its huge bulk and seeming unwieldiness, the compact and almost perfect structure of man, the lowly lichen, the towering pine, or sturdy oak, the examiner is in the presence of machines (according to the mechanical and monistic theories) so admirable in construction, so aptly put together, that every part in some way subserves the purpose of the whole, and besides inherently possesses the power of repairing the waste, the result of the vital energy. Can he when all these amazing and intricate contrivances are laid bare before him turn from them and believe that all he has looked on are but the accidents of mechanical adaptations? If when looking at a steam engine, or any other intricate piece of mechanism, we were told that there was no purpose in the arrangement of its parts to produce a given effect, and that the unity of action we saw was produced by an accidental arrangement of its parts, and that the intellect of the constructor had no part in the shaping and placing the cylinders, wheels, and cogs, &c., of the machine, we should think the person so speaking undervalued our intelligence, or was himself incapable of understanding the mechanism before him, however fluent he might be in explaining the functions of their particular parts,

* Lyell's "Geology."

and the admirable adaptability of each to each, contributing without break to the action of the whole. Yet when the processes of nature are the machines in contemplation, in all seriousness we are told that there was no purpose in their construction, no manifestation of intelligence in the adaptation of part to part, no consideration of their fitness, and that there was nothing to show that the object to be achieved was in the contemplation of the architect, who builded so well that, not only were the several parts properly adjusted, but that each object played its part in the machinery of nature; and that those perfect but diversified machines are not only complete in themselves, but are stepstones in the great economy of an orderly universe; and that all this order and manifold arrangement is but the accidental development of particular gases which cohered and produced by their own institution an albuminous substance termed "protoplasm," which in itself had animation and the power of reproduction and differentiation; that there was neither plan nor purpose in the development, that there was neither founder nor architect, but that the accidental agglomeration of different gases intermixing in different proportions would adequately account for the flora and the fauna of the earth.

We may talk of teleology and deride it* and substitute spontaneity, yet when spontaneity is paraded we may well demand from whence was the intelligence and purpose so evidently underlying the processes of nature derived? Human technics require intelligence as an antecedent to mechanical manifestation.† It is then indeed but sorry reasoning to deny intelligence to the formative power through which Nature's machines grew into being. I am not now arguing that this formative principle necessarily is God—that I have proved elsewhere.‡ I am merely testing the sufficiency of the monistic or materialistic propaganda by the commonest phase of surface reasoning. It may be an *a priori* assumption to speak of the existence of God, but language gives no term for that reasoning which denies intelligence to the formative principles dispersed throughout natural phenomena.

All persons who reflect must allow (in fact it is a scientific axiom) that there can be no mechanism or artistic delineation produced without intellectual application, without intelligence as the formative power. A parity of reasoning would lead to the inference that if the technics of man require intelligence to produce and perfect them so would

* *Vide* "Haeckel's "History of Creation," vol. i., p. 66.
† *Vide* Helmholtz.
‡ "Scientific Materialism."

the technics, transcendentally exceeding those of man, as displayed in nature require intellect to conceive and perfect them. The persistence of denial which underlies the whole argument is mainly due to the fact that in Nature's machines we find the completed form without at the same time seeing the process of the details, and so they are pronounced to be self induced; this cannot be said of a complicated machine constructed by human power, or of a fine work of art with the initiation and every manipulation of which we are familiar; yet how easy would it be to understand the diversified mechanics of nature if we did for the processes of nature that which we do when contemplating a machine or a work of art, viz., interfuse the intelligence used in the work, presenting the object as a compound of intellect and material. We would then suppose that when looking at a natural product we were viewing a compound of matter and mind, and that the energy of the formative principle and its power were interfused with the substance out of which phenomena have arisen. Matter then would be considered merely as the vehicle and intelligence as the machinist and moulder of the form; the effect produced would then be but a continuation of the formative cause. Such view would in no way deny the developement theory, the evolution hypothesis as it is called. Scientific theories may be promulgated and sustained without impinging on theological dogmas, with which they have nothing in common, also without a subversion of religious ideas or the reverence which all well balanced minds have for the Great Supreme.

Whenever a systematic denial is given to the theory of evolution we search for the reason and find that it arises either from the absence of a knowledge of its teaching, from an absolute ignorance of natural science, or from a warping of the judgment by some theological bias to which the deniers are attached, and the desire to uphold some dogma in which they are interested. Theologians and materialists equally err, the first in thinking it incumbent on them to uphold at any cost their beliefs, thinking, as many sincerely do, that all discussions of the creation hypothesis and disquisitions on the subject are incompatible with the teachings by which they are indoctrinated; the latter deny the existence of God in creation, deeming his interposition to be teleological or miraculous, as though it were less miraculous to suppose that all we know of nature and of the orbs which stud the skies eventuated without a director or founder: perhaps a great factor in the idea is that the introduction of God into the scheme of the universe would be wholly de-

structive of their supposition. The vehemence of each, in the calmness of reflection, appears equally absurd; that of the theologian in supposing that his creed comprises within itself the all of the creative problem, and of the materialist that in his science he has the ultimate facts of knowledge; yet with the denial he inconsistently admits that there is a *first cause*, at the same time denying to it personality or authority, under the plea that it is indefinable, unknowable and unthinkable. Where is there an ultimate origin which is not so? The scientific axiom that the unknown should be interpreted by the known should at the least teach them that there may be powers in the universe of which they know nothing.

A narrow bigotry—and this is as true of science as of theology—can serve no purpose but that of an acrimonious discussion: it is one-sided, and therefore necessarily it is untruthful. Religious hierarchies are built upon the ignorance of their supporters, and have gained a lengthened existence through a systematic despotism, by which they suppressed all intellectual advances through which alone the tone of the human race could be elevated. The Romish Church throughout its career has manifested a persistent determination to suppress all philosophical theories subversive of the Genesis "revelation." It is to be hoped that the education of the masses will lead to the erosion of dogmatic assumptions, and to a right knowledge of religious and of scientific tenets; it will be then possible to accept Goethe's magnificent idea, and all men will discern God in Nature and thereby be incited to a reverence for the formative power. The propagandists of materialistic dogmas are doing that which the Church has done through the bygone ages, although in an opposite direction; this course can but lead to the subversion of the tenets they would promulgate. The admission of a cause, necessarily the antecedent of all we know or can conceive, appears to be placing the monists upon the horns of a dilemma.

The mechanical theory of the universe may be well upheld (it being the only reasonable Kosmic theory the mind of man can conceive): it is quite consistent at the same time to admit that there is a directing intelligence, and the manifestation of a purpose in the formative processes of nature linked with a power commensurate with phenomenal results and their perpetuation. Herein may be found the keystone of the arch on which an edifice may be raised, the topmost pinnacle of which would be crowned by the entity of God.

IV. EXPERIMENTS WITH THE "JUMPERS" OF MAINE.*

By GEORGE M. BEARD, M.D.

ABOUT two years ago my attention was directed by my friend Mr. W. A. Croffut to the fact that, in the nothern part of Maine, especially in the region of Moosehead Lake, there were to be found a class of people who presented most incredible nervous phenomena.

These people were cslled in the language of that region "Jumpers" or "Jumping Frenchmen." It was claimed that all, or most of them, were of French descent and of Canadian birth, and that their occupation was mainly that of lumbering in the Maine woods. Mr. Croffut introduced me to D. W. Craig, Esq., a gentleman who had spent much time in that portion of Maine, and who had amused himself with watching and playing with these unfortunates.

In accordance with the request of Mr. Croffut and Mr. Craig, I began at that time an investigation of the subject through all accessible sources, and this year I visited Moosehead Lake in company with my friend Dr. Edward Steese, and made the investigations herein recorded.

I found two of the Jumpers employed about the hotel. With one of them, a young man twenty-seven years of age, I made the following experiments:

1. While sitting in a chair, with a knife in his hand, with which he was about to cut his tobacco, he was struck sharply on the shoulder, and told to "throw it." Almost as quick as the explosion of a pistol, he threw the knife, and it stuck in a beam opposite; at the same time he repeated the order "throw it" with a certain cry as of terror or alarm.

2. A moment after, while filling his pipe with tobacco, he was again slapped on the shoulder and told to "throw it." He threw the tobacco and the pipe on the grass, at least a rod away, with the same cry and the same suddenness and explosiveness of movement.

3. When standing near one of the employés of the house, he was told to "strike," and he struck him violently on the cheek. I took this person into the quiet of my own room, only my friend being with me, in order that the experiments

* Read before the American Neurological Association, June, 1880.

might be made without interruption or disturbance. I sat down by him, explained to him the object of my visit, conversed with him in regard to his family history and his own personal experience and observation of his peculiarity, and every now and then during the conversation, I struck him without warning on the shoulder or on the back, or mildly kicked him; and every time he was so struck he moved his shoulders upward slightly, sometimes moving both the shoulders and the arms, with or without the peculiar cry. He knew that I was studying his case; he knew that the kicks and strokes came from me, and yet he could not avoid making a slight jump or motion, as though startled.

4. While holding a tumbler in his hand, standing near to him, I told him to "throw it." He dashed the tumbler with great violence to the floor, and then began deliberately picking up the pieces in a very quiet and patient way. Whenever I struck him quietly, easily, and in such a way that he could see I was to strike him, he made only a slight jump or movement; but when the strike or kick was unexpected, though very mild in character, he could not restrain the jumping or jerking motion; but the cry did not always appear.

5. A handkerchief was suddenly thrown before his eyes by a person walking stealthily from behind. He jumped, just as though he had been struck.

Another case in the house, a lad sixteen years of age, was not so bad as this other, but still presented all these phenomena: he jumped when he heard any sound from behind that was sharp and unexpected, and struck and threw when ordered to do so. The crowd around the hotel, partly for my benefit, kept him constantly teased and annoyed, so that when he approached he had a stealthy, suspicious, and timid look in his eye, as though he expected each moment to be jumped.

6. This man, while playing with one of his mates, had thrown him to the ground; some one approached near and commanded "Strike him," and he struck him very hard and explosively with both hands at a time.

7. When standing by a window, he was suddenly commanded to "jump" by a person on the other side of the window. He jumped straight up, half a foot off the floor, with a loud cry, repeating the order which had been given to him.

8. When the two Jumpers were close together, they were commanded to "strike": each struck the other simultaneously—not mild or polite, but severe and painful blows. I

took one of these men to my room and quietly conversed with him, and made the same experiments with him as with the other case. I found him much less irritable than the other, and he needed usually stronger excitation to produce the phenomena.

I experimented with him in the phenomenon of repeating language that was addressed to him. When the command was uttered in a quick, loud voice, he repeated the order as he heard it, at the same time that he executed it. When told to strike, he said "Strike" at the same time that he struck; when told to throw it, he said "Throw it" at the same time that he threw whatever was in his hand. It made no difference what language was used. I tried him with the first part of the first line of Homer's "Iliad," and with the first part of Virgil's "Æneid," languages, of course, of which he knew nothing, and he repeated quickly, almost violently, the sound as it was uttered—"Menin Aida," the first part of the first line of the "Iliad," and "Arma-vi," the first part of the first line of Virgil. In order to have it repeated, it was necessary that the command should be very short, as well as quickly and strongly uttered. He would not repeat a whole line, or even half a line, but simply a word or two. In these, as in the mind-reading experiments, I was able to establish my conclusions by exclusion—that is, by proving that only the involuntary action of mind on body could produce the phenomena.

These experiments were repeated again and again, under various conditions at different times, in such a way as to satisfy myself, absolutely, that the six elements of error that apply to all experiments with living human beings were all eliminated, and that the facts obtained were the solid residuum of an exact scientific investigation.*

Many strange things are done by these Jumpers. One of those with whom I experimented came very near cutting his throat the day before I reached the lake. He was shaving, and the door slammed suddenly behind him; he jumped, and had the razor been held in a different way, he might have inflicted a severe wound. One of these Jumpers being surprised by an order to "strike," while standing before a

* The six sources of error in experimenting with living human beings are—1. Unconscious deception on the part of the subject experimented on; 2. Intentional deception on the part of the subject experimented on; 3. Intentional collusion of other parties; 4. Unintentional collusion of other parties; 5. Chances and coincidences; 6. Phenomena of the involuntary life. In experimenting with the Jumpers the nature of the phenomena made it easy to eliminate the main element of error, intentional deception on the part of the subject—since, unless the subject is deceived or at least surprised, the phenomena do not appear.

window, struck his fist right through the glass, cutting it severely. These Jumpers have been known to strike their fists against a red-hot stove; they have been known to jump into the fire, as well as into water; indeed, no painfulness or peril of position has any effect on them; they are as powerless as apoplectics or hysterics, if not more so; the absolute victims of the orders that are given them, or of the surprises that are played upon them; they must do as they are told, though it kill them, or though it kill others. I can find no evidence that the presence of water or of fire will interfere, even in the slightest degree, with the motions which they are compelled to make. As has been made apparent by the above description, it is not necessary that the surprises should come from any human being; it is not necessary that they should be ordered to strike or to jump; any sound from any source that comes upon them with sufficient severity and suddenness, for which they are not forewarned and forearmed, may cause them to jump and to cry. One of those on whom I experimented told me that the falling of a tree in the woods, when unexpected, would have the same effect upon him. He said that one time he was so alarmed by the sudden crash of a tree, that he not only jumped, but was perfectly entranced, so that he could not move, although the tree did not fall upon him. The explosion of a gun or pistol is almost sure to excite these Jumpers. The screech of a steam-whistle is especially obnoxious to them, few of them, so far as I have been able to learn, having been able to withstand it. On one of the lake-steamers in which I returned from the hotel there was a Jumper who, when the screech was heard, jumped right up, so that he nearly hit his head on the upper deck. As the steamer neared the landing and came to a place where he knew the whistle would sound again, he was warned to prepare himself, and he did so with such success that on the first screech he jumped scarcely any; on the second, however, despite his care, he raised his shoulders perceptibly, but did not jump. In many of these cases it may be observed, a simple raising of the shoulders, a sudden impulsive movement, is all that is done, there being no cry and no movement of the hands to throw or to strike. Although called "Jumpers," they only *jump* in a minority of the experiments, the word jumping really including all such phenomena as lifting the shoulders, raising the hands, striking, throwing, crying, and tumbling. Jumpers have been known to fall head over heels over an embankment on which they were sitting, on suddenly hearing the whistle of a locomotive; they have been known to tumble head over

heels over one another, when a number of them were sitting near each other.

The order to "drop it" they are compelled to obey, as well as that to strike, or to jump, or to throw. On one of the steamers on the Rangeley Lakes there was a waiter who was a Jumper, and when told to "drop it" he would drop whatever he had in his hands, even if it were a plate of baked beans, on the head of one of the guests. The Jumpers with whom I experimented exhibited the same phenomena.

These phenomena suggest epilepsy, particularly in their explosive character and in the nature of the cry. The hands strike or throw with a quick impulsive movement, which is very hard to imitate artificially. They go off like a piece of machinery; it is more like the explosion of a gun than the movement of the limbs of even an angry man; and the cry suggests that which we hear in hysteria and in epilepsy. The face does not always exhibit any change, but in some cases there is a temporary flushing, and in others a temporary pallor.

All the Jumpers agree that it tires them to be very much jumped; that they feel worse after it, more or less exhausted and nervous; they all dislike to be jumped, and avoid it when it is possible; the more they are jumped the worse they are; and that after a while in the woods, where they are constantly teased and annoyed after the day's labour is over, they are made worse; whereas, after long periods of rest they become better, are less irritable and jump less, and do not jump so easily on excitement.

Nature of this Disease.—What now is the pathology of this jumping? How are we to rank these phenomena among the neuroses? What relation do they bear to the great family of diseases? Are they functional or structural? Are they physical or psychical? The answer is clear: jumping is a psychical or mental form of nervous disease, and is of a functional character. Its best analogue is psychical or mental hysteria, the so-called "servant-girl hysteria," as known to us in modern days, and as very widely known during the epidemics of the middle ages. Like mental or psychical hysteria, this jumping occurs not in the weak, or the nervous, or the anæmic, but in those, as a rule, in at least good if not firm and unusual health; there are no stronger men in the woods or anywhere than some of these Jumpers. Although some of them are injured by being excessively jumped for the time at least, yet to the majority, if not nearly all, this injury can not be said to be of a serious character. It does not apparantly shorten life, and does not bring on, so far as I can learn, any other form of nervous disease. It can not, therefore, be said to be in any sense a

disease of nervous debility. Those who suffer most from it are the very opposite of neurasthenics or anæmics; they have none of the symptoms detailed in my work on nervous exhaustion; they are full-blooded and strong-nerved, capable of working hard and long at the most toilsome service, and will hold themselves up full and sturdy and enduring, side by side with the hardiest men in the nation. Like "servant-girl hysteria," and like certain forms of chorea or "jerks" as they are called, which appear or have appeared in certain religious revivals, like the "Holy Rollers"* as they were called in the religious revivals of northern New Hampshire, these Jumpers are contributions to psychology more than to pathology. Far out of the range of the aided senses, far beyond the reach of the microscope, or perhaps of the spectroscope, there may be molecular changes or disturbances which manifest themselves in these jumpings and strikings and throwings as a result and correlative. But for the present, possibly for all time, we can only study this subject psychologically; we can only approach it satisfactorily from the psychological side. Only those who clearly recognise the two distinct types of hysteria, the neurasthenic or anæmic form, which may be called *physical* hysteria, and the mental or psychical form, which may be called *psychical* hysteria, can understand the nature of this peculiar malady of the Jumpers; but those who do comprehend and recognise these two types of hysteria will have little difficulty in comprehending the general nature of this jumping and its position among the neuroses. Some of the cases of hysteria major on which Charcot has experimented with his metals and magnets belong, as I am persuaded from personal observation, to psychical or mental rather than to physical diseases. I can find in the families of those who suffer from jumping no proof of any form of functional or organic nervous disease.

Jumping is, therefore, a *trancoidal* condition, exhibiting a part of the phenomena of trance, and bearing the same relation to trance that certain epileptoidal conditions bear to epilepsy.

Although the phenomena exhibited by the Jumpers are analogous to those of mesmeric trance, of mental hysteria, of the "Jerkers" and "Holy Rollers" in revivals, they yet differ from all these and all allied forms of nervous disorder in these two respects:

1. The *momentary* character of the manifestations.

In but a second or so all the acts of the Jumper—striking, throwing, dropping, crying, jerking, or jumping—are over

* So called because they rolled over and over on the floor while under religious excitement.

completely, and he is about in the same condition as before he was surprised. The explosion of the Jumper, like the explosion of a revolver, is sudden and instantaneous; and like a revolver, also, the Jumper is at once ready for a new explosion on proper excitation. If we look at a Jumper five seconds after he has been jumped, we see no sign or indication of what he has just done, or of what he can instantly be made to do.

On the other hand, the phenomena of trance, of mental hysteria, of the "Jerkers" or "Holy Rollers" may last in any given case from several minutes to several hours or days.*

Recent German investigations have, by an interesting coincidence, demonstrated that subjects in the mesmeric trance sometimes exhibit the phenomenon of repeating automatically what is said to them. Berger produces this effect by laying his warm hand on the neck of the mesmerised subject.

2. In the persistence and permanence of the liability to be excited.

After once the habit of Jumping is formed, the subject, though varying in susceptibility at different times, is yet always capable of displaying the phenomena in a greater or less degree at any moment; once a Jumper always a Jumper expresses the prognosis. Epidemics of jerking and rolling are, on the contrary, limited in time and in their sphere, disappearing and dying utterly away with the excitements that give rise to them, and the habit of hysteria or of being entranced may also be outgrown.

Psychologically, these Jumpers, so far as I have been able to see or to learn, are modest, quiet, retiring, deficient in power of self-possession, conceit, and push, but no more so than many others in various races. I have been told that they were of a low order of organization—half-breeds, partly French, partly English; but in this respect I was misinformed; they are at least as intelligent and as capable of fulfilling the duties belonging to them as the average of their associates who are not Jumpers; some of them can read and write, and all whom I saw could converse in English with a reasonable degree of intelligence; possibly as much as we could expect of persons of their age and environment. But all of them, without exception, were of shrinking temperaments. In the chorea epidemics of the middle ages, or of the great religious revivals of this country, this class would be very likely to have been attacked.

* In my work on "Trance" these phenomena are described in more detail than is here possible.

V. A DEFENCE OF THE DOG.

By H. Bellyse Baildon.

THE dog has had his day! The most versatile, intelligent, and faithful of animals, the comrade and ally of man from savagery to civilisation, has received sentence; he is like the Caucasian, "played out;" an *invisible* hand has written on the kennel, that his days are numbered, that he has been weighed in the balance and found wanting. He is not, indeed—desirable as that appears to be—to be exterminated by sweeping slaughter, to be proscribed at once for immediate execution. No; but the "schoolmaster is abroad," and slowly, but surely, man is to be educated into a contempt for his *quondam* companion until he reaches the point (the very *nadir*, alas! of meanness) of giving his old friend the cut direct. On the altar of economy, science and civilisation, the victim is to be bound, and the sacrificing priest is to be none other than his old crony and accomplice. What a pathetic parting will it be between the last dog and the last master; what infinite reproach in the silent, wistful back-look of the contemned servant; what dumb, unspeakable shame in the heart of the regretful lord! Then as the years go by, the memory of the extinct monsters will grow faint; no record remaining of them, save their ghastly effigies on the dusty shelves of museums; for we will surely be too much civilised to care to preserve such relics of a bygone superstition as the now-admired pictures of Landseer. Our posterity will wonderingly refer to their zoological text-books to discern what quadruped mammal it could be which recognised the returning Ulysses and died at his feet. And the Dryasdusts of the period will contend as to the true form of the skeleton of the member of the vertebrate kingdom who licked the sores of Lazarus.

It is well that there are philosophical minds that can contemplate such a consummation with equanimity, not to say satisfaction. The present writer must confess that he has not yet attained the necessary intellectual altitude to enable him to regard the final separation of man and his immemorial associate in good and evil without a pang. Historically, pre-historically, and scientifically, to say nothing of socially, economically, ethically, and psychologically, the dog presents a subject of almost unique interest.

His attachment to man's service marks an era of supreme importance to the anthropologist. Cuvier goes so far as to say "the dog is the most complete, the most singular, and the most useful conquest ever made by man," and, while it is very difficult to compare it exactly with so noble a rival as the horse, one is certainly bound to admit that it performs a greater variety of services to, and is almost invariably more of an intimate with man. In this reference how completely the strong points of the dog supplement the weak of the primitive or savage man! As to the senses, the sight, taste, touch, and even hearing of man might have been fully on a par with those of his coadjutor, but his scent must always have been (regarding him as a frugivorous quadruman) vastly inferior; the dog having probably the most discriminating, if not the actually keenest, olfactory sense of any living creature. Nor is it likely that biped man ever possessed the splendid turn of speed which dogs of the hound kind can command; still less has he the formidable prehensile apparatus furnished by a dog's teeth and jaws. Thus, man could hardly have been a hunter before his fortunate alliance with the dog—at least his success must have been very indifferent. Besides, he would be so much more liable to destruction himself by the more formidable beasts of prey, of whose approach his defective organs of smell would not timeously apprise him. Of the beginning of this most effective defensive and offensive alliance we have no record, as we have conclusive signs of its existence far back in prehistoric time, a fact which of itself should be sufficient to render the animal an object of permanent interest, if not of respect and regard, with the man of science. We constantly hear protests from naturalists against the destruction of rare animals, whether birds or beasts, even when they are wholly predatory; much more must we protest against the bare idea of the extermination of the dog. At least let us preserve him until he has been exhausted as a subject of study. Now, as it happens that investigators like Herbert Spencer and Dr. Bastian have only initiated that study on the basis of combined physiologic and psychologic facts, it follows that upon that score alone the friend of man ought to have a long lease of existence. Anyone wishing to be made aware how pregnant and interesting this subject is, should read the admirable summary of it by Mr. Grant Allen in the *Gentleman's Magazine* for September, wherein he fits together existing knowledge of the matter, supplementing it with his own careful and acute observations. And, perhaps, here I may be allowed, without launching upon the infinite sea

of dog anecdote, to mention some matters which have puzzled me with regard to dog knowledge which Mr. Allan's paper does not touch upon or leaves unexplained, in the hope that he or some other cynologist may enlighten us.

The most important and largest problem which it seems awaits solution is expressed in the question "How do animals, and notably dogs, cats, and horses, communicate ideas, as they unquestionably do, to one another without speech?" I have noticed, as everyone acquainted with dogs must often have done, one dog run up to another (a familiar friend, of course), and, simply by laying his nose to his crony's, put him in possession of some fact, idea, or intention. One could, at any rate, draw no other inference from their conduct, seeing that they immediately started off together in a most purposeful style, as though resolved and unanimous. It was just as though one said to the other, for example, "The gardener's cat is sitting on the window-sill of the toolhouse; suppose we go and hunt her?" To which, to judge by the alacrity of his consent, the other seems to reply, "All right, old fellow, with the greatest pleasure in life." Perhaps it may be suggested that, after all, this is to make the dialogue unnecessarily elaborate, whereas the application of the nose may only have been equivalent to a nudge or a wink, meaning, "Come here, old fellow, there's some fun going." But I think that, apart from the deliberative air the second dog assumes on receiving the communication, the other could quite well by a signal bark have summoned the other to him. No doubt in this particular instance the bark would have spoilt the sport, but there must be many others where this objection would not apply. Mr. Allan's view of the "Dog's Universe" certainly suggests an answer, although that answer may seem one not easily credible. I would state the matter in this way: If the outer world expresses itself to the dog's mind mainly in terms of smell (as ours does mainly in terms of sight), and if, as seems very possible, his mind correlates these sensations so far that his smell-world becomes a whole and not a mere series of separate impressions (even as our sight-world does to us), does it not seem likely that, even as we can express so much directly by the eye, although by no means shut up to this instrument of expression by reason of our gift of language, so the dog may have some faculty of expressing himself through the nose. This would, no doubt, involve the faculty of emitting a certain odour at will, so as to form a code of smell signals. And the incredibility of this idea is considerably lessened when we recall the fact

that many animals have the faculty of evolving certain very perceptible odours when excited or irritated. All that would be required would be an extension of this faculty so far as to allow of a sufficient variety of odours being given off to constitute the elements of a code. That the dog is able to convey his emotions in some such way appears certain from the conduct of dogs when they meet. Except in cases where there is an old-established feud or friendship they invariably go through certain preliminary observations of canine etiquette, and not until these are punctiliously performed do they proceed to demonstrations of friendship, or overt acts of hostility. Somehow, they seem empowered to carry an insult or a welcome, to express enmity or amity. Whether a dog forms his opinion of another by his smell, as we judge a person "by their looks," one cannot decide, but certainly the nose and not the eye seems to be the critical organ.

I agree with the writer of "A Dog's Universe" that it is unphilosophical to account for his power of taking a straight route to a place from which he was brought by an indirect one, by ascribing to him a special "sense of direction." Then this animal seems to have the power (which we do not possess, except to an extremely limited extent) of discovering the exact direction from which an odour is coming. Human beings, of course, discern direction infinitely better by sight than by any other sense. We may be able to tell the direction from which an odour comes if the source is a few feet off, that of a sound although a good many yards off. But as to both direction and distance we are best informed by sight. Dogs do not seem to see things at a distance very clearly, and often appear at a loss as to the exact *locus* of a sound, although its origin is no great way from them. It follows from these facts that they must get their notions of direction from odours. A trail, I suspect, is as distinct to a dog's nose as the track of a steamboat or footsteps on snow are to our eyes. Hence I would explain the case of the hound which, according to Dr. Bastian, "was sent from a place in County Dublin to another in County Meath, and thence, long afterwards, conveyed to Dublin Town," and which from thence found his way in a direct line to his native kennel, by saying, that some day, when the wind was blowing from that quarter, a whiff of the scents familiar to his puppyhood was carried to him, and he was seized with homesickness, and forthwith set off in the right direction. Whether he travelled by road or across country I do not know. If he went by road he might be assisted by the trail

of some inhabitants from his native village, or from someone who had recently passed along it. Or, again, it may have been the presence in Dublin of someone familiar to him in youth that gave him the clue to the direction of his home—in the first place by arousing old associations, and secondly by affording him a trail to follow up or trace back.

Perhaps we have followed this scent rather far, but before making a fresh cast I would like to tell one dog story, in the hope that Mr. Allan or some other authority may give the *rationale* of it. I may say that I have the story at first hand, and that I know the dog it is told of *personally*, and know other instances of his sagacity little less remarkable. His master had received two invitations for the same evening, one to dinner, the other to a dance or card party later on. Neither of the houses were those of intimate friends, and if the dog had been at either, it was only a very few times. When the master set out for the dinner, he told Gyp that he could not come with him, and the dog, with an air of profound depression and reluctant submission saw him depart without an attempt to follow. Sure enough, at the first place of call no Gyp appeared, but when my friend presented himself at the second he was greeted with the exclamation, 'Why, Mr. ——, your dog has been here ever so long, waiting for you." Gyp greeted his master with slightly embarrassed but effusive welcome, as much as to say his obedience was literal, and not to the spirit "Oh, I'm so glad to see you, and you know you didn't say I wasn't to come *here*." The mere chapter of accidents will hardly account for such a coincidence as the animal going to the right house and waiting there some time. Had he merely called there and happened to hit the time of his master's coming, one might have said he was going a round in search of him, and had made a fortunate guess. I will not here attempt to explain the matter, rather trusting some expert may be able to elucidate it.

So much, then, for a single aspect of cynology—or, rather, so little; for it is a subject that would make material for volumes. What one may call dog-lore, including in the term legends, tales, superstitions, nursery-rhymes, incidents, fables, proverbs, up to actual historical events, would form an extensive literature, and has not received one whit too great attention, being well worthy of more systematic treatment than seems yet to have been given to it. It is obviously impossible within the limits of a reasonable article even to outline this vast field, but the mere indication of it should be sufficient to make us pause before we conclude the dog has become, or is fast becoming, a worse than useless

luxury, which it is desirable to be rid of as early as possible. But to this conclusion the author of the article on "Modern Cynolatry" seems to have arrived, and upon what are, to my mind, quite insufficient grounds.

In the first place, your contributor assumes the comparative uselessness of the large majority of the canine species, an assumption which cannot be allowed to go unchallenged. Wishing to keep the argument down to convenient limits, we will not, as he has done, go beyond the British Isles to find our instances of combined usefulness. To take one very clear case, the utility of the sheep-dog or herd-dog is unquestioned, and although it is on unenclosed land that they are less dispensable, they are in constant and exclusive use in the driving of sheep, cattle, and other animals from place to place, in singling out individuals from a flock or herd, and so forth. Imagine such ordinary operations as sheep washing, clipping, or marking, carried on without dogs! At the same time, I doubt not that a large percentage of the biting laid to the charge of dogs may safely be attributed to collies and dogs of that strain, seeing that they are (with strangers) about the most uncertain and crossgrained of their race. Would it not be very hard that a farmer or shepherd should lose a cherished and valuable dog, because in a moment of mistaken zeal, it had once bitten a human being? Personally, if I were the victim, I should not think of exacting the penalty, firstly, because it would be greatly disproportionate to the owner's blame; and secondly, because the continued life and health of the dog would be the best guarantee of my own safety, or the clearest and most important index of the reverse. In this reference it is, perhaps, only fair to admit that I have never, though having to do with a good many dogs, been bitten in anger by a dog, though I have frequently had the blood drawn in accidentally playing with one. Several times I have been attacked ferociously, but invariably found the use of a stick or umbrella, or, indeed that of the voice sufficient to keep the brute off. One cannot help suspecting that Frank Fernseed has not been so fortunate in his experience of the kind and has at some time been bitten, with resulting cynophobia. As there are some men who never sit a horse well, however much they ride, so there are some persons who never get on well with dogs, while there are others, like Sir Walter Scott, who seem to have an extraordinary fascination for them and for all animals. Undoubtedly the one thing a dog respects is courage, as is well illustrated by the story of Emily Brontë and the bulldog. The one fatal thing in an

encounter with a dog is to show the least atom of white feather; yet to any person of highly nervous temperament, or one unaccustomed to command animals, it is doubtless very difficult to sustain an attack wtthout flinching. The instinct of predatory animals is that of pursuit, as seen in their young, which pounce on or follow up any object, animate or inanimate, which retreats from them. Cats and dogs will often appear indifferent to the presence of a rat in a confined space, though keen and clever enough at seizing them when running off in the open. It is this instinct of pursuit that makes it so natural for a dog to run after a stick or stone, so that the only parts of the fetch-and-carry trick that needs much education is the returning to the master and relinquishing the missile. Hence it is that the least retrograde movement in the presence of a canine enemy is so dangerous. And in view of these facts and considerations, I cannot but think that the great majority of those who get seriously bitten, owe it, in part at least, to their ignorance of dog-nature. The observance of a few rules will save most adults, under ordinary circumstances, from being bitten; such as: "Stand your ground resolutely and speak boldly to the dog;" "Do not pat a strange dog till you have held out your hand to him and seen that he receives it in a friendly manner, and then, if he does not lick it or wag his tail, leave him alone;" above all, "Never touch any dog *while sleeping*, as they undoubtedly dream of hunt and combat, and the touch, however friendly and gentle, may take the shape of an attack or menace from their visionary antagonist, and thus induce them to snap in its direction before fully awake." Now, even as we must learn by experience the physical properties of surrounding objects, it surely is not too much to expect, even from the "average man," some knowledge of dog-nature. I quite fail to see why a man who, through his ignorance of dog-nature gets bitten, has any more claim upon our sympathy than the man who, through ignorance of gas-nature, gets burnt or blown to pieces. We pity both, doubtless, but while we say, "What a fool to go near an escape with a candle!" why should we not say, "What a fool to touch a sleeping dog!" The greatest difficulty is with children, who almost invariably display towards animals a perilous intrepidity or a still more perilous timidity. Yet there are dogs who will suffer themselves to be pulled about by children with an amount of patient endurance not excelled by that of the best-natured bachelor uncle.

But we must return to the question of canine utility, which apart from that of those in which it is universally and legally

acknowledged, we still maintain to be very great. Take, for instance, a class of dogs which one might at first sight be tempted to rank as useless, viz., little pet dogs. Yet it is stating the case very moderately to say that these dogs in the aggregate constitute as great a protection to house-holders and their property as do the whole of the police force. They are the one guardian element (when kept *inside* of course) which the burglars cannot overcome or tamper with. Personally, if I had to choose betwixt having a police-man within half a mile (I am referring to the country) and a dog within my house, I should not hesitate a moment to elect to take the dog, which both as a deterrent and a preventive I should expect to prove the more effectual. Seldom or never do the police prevent or detect in progress a burglary which has been determined upon by the professors of that art, whereas the first yelp of a pettish terrier sounds the knell of the robber's hope. Moreover, the value of such dogs in this respect arises from their highly excitable and even irri-table natures, and one that is uniformly friendly and good-natured is all but useless. Hence, undoubtedly, this class is responsible for a great deal of the biting that takes place, yet it would seem manifestly unjust to visit a single offence of this kind capitally on a dog as it would be to shoot a horse for throwing his rider, or running off with a carriage in a crowded thoroughfare.

Even with regard to the large watch-dogs, although the professional burglar can doubtless deal with them only too efficiently, still, while they are always an additional obstacle even to him, they are certainly a great protection to gardens and orchards from the inroads of petty thieves. They like-wise constitute the most effective guardians a lady walking out alone or a man going through dangerous neighbourhoods at night can obtain. I never heard of a man being garotted when he had a large dog with him. So that even this kind of dog is not so completely played out as your contributor would have it appear.

There still remain to be considered those dogs that assist man in his predatory pursuits, but which are more politely termed sports. Their name is legion, and they range from the tall, wiry deerhound (with something of the grace of its quarry) to the shivering rat-pit terrier and debased-looking bulldog. The question of the ethics of the higher forms of field sports is too complex to be discussed here, and would have to be answered before any decision as to the utility of this class could be arrived at. Still, it would be difficult to prove on broad grounds that fox hunting, grouse shooting,

or even coursing, are necessarily degrading employments; nevertheless, rather than seem to press a doubtful advantage, we prefer to admit the absence of strict and immediate utility in this division. And most cordially and unconditionally is it here confessed that the society of the prizefighting bull-dog and the cat-worrying and rat-pit terriers does not tend to elevate their masters. Likewise must Mr. Fernseed's opinion of the validity of the "poor man" argument be here thoroughly endorsed. The poor have so little to lose that they do not require dogs as guardians of property. Nor is seven-and-sixpence a sum which would deter any skilled labourer from keeping a dog if so inclined.

As to the treatment of stray, ownerless dogs I consent, however sorrowfully, to your contributor's sentence of "judicious butchery," and I do so from the dog's point of view no less than from man's, seeing these neglected curs—the chief, if not the only source of rabies—are lucky in being put speedily out of existence. Further, I fail to see the great hardship of enforcing, especially during the summer months, the wearing of muzzles, which, made of wire and properly fitted, are but a very slight infringement of the creature's comfort and liberty. Particularly is this desirable where dogs are allowed, as many are, to wander about alone, uncontrolled by their master's presence. There are likewise certain canine crimes and misdemeanours that demand severe punishment. Sheep-worrying I would make a capital offence, as it is an all but incurable habit, corresponding to dipsomania in the human race; it should certainly be competent to the guardian or the owner of the sheep to shoot the dog if caught in the act, or for the magistrate, if the offence is brought home, to order the brute's destruction. The practice some curs have of rushing at and following horses and vehicles is decidedly dangerous as well as annoying, yet, not being by any means absolutely incurable, the first few instances might be left to the master's discipline; but in confirmed cases, when he will not shut up the offender, he should at the least suffer heavy fining. A few sharp punishments should cure a young dog with any docility in his nature of this pernicious habit, and as a general principle an owner should be liable for any damage resulting from his dog's misconduct; that is to say, when it is not occasioned by wanton provocation on the part of the sufferer.

But, after all is said, the existing law is not so inefficient as Frank Fernseed wishes to imply, which anyone may see by glancing over any summary of the law on the subject; and, indeed, it would be difficult to increase its stringency

without occasioning hardship to dog owners and to the animals themselves. That we cannot shoot a dog offhand, like a wolf, is a very irrelevant complaint. It is simply a case of the general principle that in a law-governed country one must not, except in the extremest danger, take the law into one's own hands; for even a burglar cannot safely be shot unless it can be shown that he is threatening your person as well as your property. That so many as 14,000 people should suffer from dog-bites and 35 perish by hydrophobia annually is deplorable, doubtless, but it cannot be accurately described as a "wholly gratuitous curse." That a certain moiety of these injuries and deaths might be prevented by greater care on the part of dog owners and a more rigid administration of the existing law, there is no room to doubt, yet it would be difficult to find any other cause of death to which we are liable which counts so few victims as 35 per annum. No facts, indeed, are more liable, with all their apparent certainty, to give a seeming basis to unsound deductions than statistical ones. What an appalling chapter could be written on the destruction of life through horses? All populous towns, and London especially, appear positive shambles when we read of the daily, far less the annual, destruction by horse traffic. Yet a horse is, in numberless cases, quite as much a luxury as a dog. The carriages of the wealthy are only in the remote and secondary sense necessities, and even travelling by cab or omnibus is frequently a lazy luxury. By cutting off, through removing all unnecessary vehicles, this "wholly gratuitous cause," more lives would be saved in a week than would be saved in a year though every dog in the kingdom were hung to-morrow. As to cost, there is no comparison, and if one were but paid the annual expenditure over horses one could safely undertake to endow the whole canine community with a sufficient and perpetual annuity.

But, even for a moment granting the supposition that the utile functions now performed by the dog may be in the future executed by some other agency, we should still expect to see the dog flourish almost as before. A pet dog is to many people a great pleasure and entertainment, in short, an immense *luxury*. As to which thing, luxury, there is a point to be cleared up. A luxury is often spoken of as synonymous with a superfluity, and, therefore, the contrary of a necessary. This is not so, for it is a curious point in human nature that with it *some luxury seems a necessity*. Smoking and drinking are undoubted luxuries, and yet they are the last thing that the poorest will dispense with. In

fact, the harder a man's life is in the main, the more determined he seems to have some hours of luxury at the end of his day of toil. Hence some of the most skilful and industrious of mechanics are most liable to indulge in their staple luxury of drink. To say that a thing is a luxury is not the equivalent to saying that it can practically be easily dispensed with. And one is undoubtedly well within the mark in saying that a 'pet dog is one of the cheapest, safest, and most innocent of luxuries.

VI. A SAFETY PAPER FOR CHEQUES.

WE have to notice an unobtrusive but yet important invention, destined, unless we are greatly mistaken, to put a final stop to one of the most ingenious and formidable frauds of the present day. As the commercial world is but too well aware, a man who is supposed to be financially sound, sometimes makes the disagreeable discovery that a cheque bearing his signature has been presented and paid at his bankers, the sum being much larger than that shown by the counterfoil. The banker has committed no error or oversight in the matter, the drawer's signature is indisputably authentic, but the figures and words expressing the sum have evidently been altered. For this purpose the writing must have been wholly or partly effaced and other figures or words carefully substituted. This process, difficult as it may appear, presents nothing impracticable to a man conversant with the nature of colouring matters. The inks in common use, numerous as they are, and various as is their composition, are all capable of being discharged by chemical agents, some of them of an acid, and some of an alkaline nature. The knowledge of how this operation may be effected is not confined to upright men. A rogue may study and experiment for this end as carefully and patiently as a colour-mixer might in attempting to bring out a new discharge style in calico printing. Further, though we do not believe that any chemist of recognised eminence would knowingly give advice to any intending forger, yet it would be easy to

put the question in such a manner that the applicant's purpose would never be suspected. When once the writing in the body of the cheque has been effaced, the paper is re-sized and such a sum filled in as amply repays the operator for his trouble.

It must not be supposed that bankers have made no attempts to defend themselves against this fraud. Colouring matters calculated to be affected by any agent supposed capable of discharging writing inks have been mixed with the paper pulp, and applied in various designs to the face and the reverse of the documents. Before us lies a cheque which has been filled up experimentally for the purpose of testing those supposed safeguards. The paper itself contains Prussian blue, produced by successively treating the pulp with potassium ferrocyanide and with a per-salt of iron. This tinting is intended to detect the application of any alkali which would decompose the Prussian blue and produce in the place of a blue tint a rusty yellow. On the reverse side of the cheque is a design in ultramarine, a pigment easily destroyed by acids, while on the face the name of the bank and the space to receive the writing are executed in an aniline violet. It may perhaps surprise the non-chemical public to be told that these precautions can be overcome. Such, however, is the case. The words "eighty-seven pounds," and the figures, "£87 0 0," for which sum the cheque was filled up, have been completely effaced, leaving the name of the payee and the word "Specimen," written where the signature would stand, untouched. Not only so, but the general tone of the paper, the ultramarine design, and the violet tinting on the face are unaltered. A gentleman of great experience in the tinctorial arts, and accustomed to detect the slightest difference in colours, declares on comparing the effaced cheque with one in its original condition that he could not detect any alteration.

The invention which we are endeavouring to expound, and which is due to the ingenuity of Mr. A. A. Nesbit, F.C.S., takes a point of departure at once novel, and yet as simple as the egg of Columbus. Every chemist knows that there are colours, of which litmus may be taken as a type, which are capable of being modified both by acids and by alkalis, but in a different manner. Suppose the cheque is first coloured a pale uniform greyish blue with neutral litmus. If we then print upon this with a dilute acid we shall produce red letters, lines, or devices. By a second application, of an alkaline liquid, we produce decided blue lines or devices, which may be interwoven with the former. We then fill

up our cheque with any ordinary writing ink, and pay it away in perfect confidence. Let us suppose it falls into bad hands. To discharge the writing he applies, say, a dilute acid or the solution of an acid salt. Immediately the whole surface of the cheque assumes one uniform red colour and the letters, lines, and other devices disappear. Suppose he then tries to undo the mischief by the application of an alkali or the solution of an alkaline salt. At once the whole document is turned blue, and the words, &c., are not reproduced. If he applies the alkaline liquid first, the design is equally destroyed. Let us even suppose that the forger discovered some perfectly neutral liquid capable of removing writing ink. Even here he could be met by the simple contrivance of printing the design in a deeper or a paler red, produced by the application of a stronger or a weaker acid. If a design thus produced is moistened even with a neutral liquid, its distinctive shades will be affected and the characters blurred. The invention further proposes to print inscriptions and marks on cheques partly by the method already described, and partly in ordinary printers' ink, "the inks being so printed that the marks or inscriptions are composed of fine lines or lettering of the dye alternating with lines or lettering of printers' ink, the printing being effected in a machine of very delicate registration." Hence, if all the coloured part of the inscription is removed from a cheque, it is practically impossible to reprint it, even with the block with which such coloured part was originally produced.

The acid which the inventor prefers is the oxalic, as it possesses the property of not corroding the plates or blocks used in printing. It forms upon the face of the plate a thin layer of insoluble oxalate, and thus prevents all further action. In the important point of cheapness, nothing can be objected to in Mr. Nesbit's process.

Judging from our present knowledge the invention may be pronounced an easy, simple, and effectual means of overcoming a growing evil.

ANALYSES OF BOOKS.

*Philosophische Consequenzen der Lamarck-Darwin'schen Entwickelungs theorie.** Ein Versuch von Dr. GEORG VON GIZYCKI. Leipzig and Heidelberg: C. F. Winter.

IN all countries, and certainly not less in England than elsewhere, the first question put regarding any new theory is not so much "Is it true?" but rather "To what does it lead?" The public is uneasy lest even the most abstract scientific generalisation may throw an unfavourable side-light upon some of its recognised orthodoxies, and will not be consoled with the truism that the novelty, if rightly induced from established facts, cannot be hostile save to errors. Unusually violent and lasting has been the excitement in the case of the doctrine of Organic Evolution. Men of culture, and even of special scientific training, like Prof. Virchow, have seen in it not a theory to be dealt with like the undulatory hypothesis of light, or the conservation of energy, or the Mendelejeffian law of elementary periodicity, but as a "heresy" "leading"† to social democracy, Nihilism, Agnosticism, and other fearful manifestations of the *spectre rouge*, and worthy not of discussion but of repression, as hinted in the too famous watchword "Restringamur." Nor must it be forgotten that certain men, champions of the social and theological views dreaded by the "powers that be" have somewhat prematurely claimed Evolutionism as an ally. Some of these coincident hopes and fears have been ably dealt with by Prof. Oscar Schmidt. Still ample room is left for our author, who enters upon his task with the declaration that "a more profound philosophy must protest against such an abuse of our great theory *in majorem materialismi et atheismi gloriam*." His object is to trace out the consequences of the Lamarck-Darwinian theory of Evolution in four main directions—as regards psychology, the theory of cognition, morals, and religion. It may here be remarked that many foreign authors do not sufficiently distinguish between Evolutionism in its widest sense, the general theory that animals and plants as we now find them have arisen by the transformation of a few—possibly of one—original types, and Darwinism the explanation of such transformation as a result of natural selection. He quotes from Prof. Zöllner the pregnant utterance that the doctrine of Darwin is "nothing other than the

* Philosophical Consequences of the Lamarck-Darwinian Theory of Development.

† Dr. Bree.

hypothesis of the comprehensibility of organic nature," the sole possible hypothesis, adds the author, unless we are willing to assume—like the Caffres and Arthur Schopenhauer—that "trees and shrubs have sprung up by their own will." It is the carrying out of the *lex continuitatis*, as proposed by Aristoteles and Leibnitz.

In the chapter on Psychology the author refuses to adopt the materialistic explanation of thought and feeling. He quotes the saying of Virchow,* that there is a "materialistic dogmatism, no less than an ecclesiastical, the more dangerous because it denies its own dogmatic nature, appears in the garb of Science, and professes to be experimental where it is really speculative." With Friedrich Harms† he reminds us that a state of motion is not its own perception, a chemical decomposition is not a sensation, nor is a process of combustion, a "glowing" of the brain self-conceptive. Granting vibrations, decompositions, and other mechanical and chemical processes, as existing in the brain, to assume that they furnish an explanation of mental activity proves merely that materialism does not even understand the problem which it believes to have solved.

Very similar is the view of Du Bois-Reymond. "By no conceivable arrangement or undulation of material particles can we throw a bridge into the realm of consciousness."

Thus repelled by the unsatisfactory nature of materialism, certain thinkers have turned their attention to a spiritual monism, of which Bruno is the chief representative. This attempt to find spirit in everything the author thinks not necessary, and takes refuge in the hypothesis of Helmholtz and Sir W. Thomson, who people the earth by the aid of a germ-laden fragment of some ruined world. Surely little reflection is needed to show that this suggestion for the moment evades, but does not solve, the mystery of the first origin of life.

The following considerations of Dr. Von Gizycki merit, however, our warmest approval. He points out how radically our psychology has been vitiated by considering the rest of the animal world as something totally different from ourselves. "Man has thus in a self-deifying spirit misconstrued his position in and his relation to Nature, and has ultimately strayed into anti-natural regions." We forget that humanity includes not merely Plato, Shakespeare, Humboldt, but even the rudest savage. The chasm between the loftiest and the lowest of our species, and that again between the highest and the lowest brute, is still deeper than that which severs the lowest man from the highest animal. Here the author agrees exactly with the conclusions which we, in our turn, have based upon the observations of a life-time. But we may still ask whether these same conclusions do not hold equally good if each animal has had an independent origin?

* Gesammelte Abhandlungen zur wissenschaftlichen Medicin.

† Abhandlungen zur Systematischen Philosophie, p. 266.

In the important chapter on Morality the author remarks that the "significance of Evolutionism for morals is to be found not so much in the circumstance that it leads to certain isolated doctrines as in the elimination of everything unnatural or anti-natural which it introduces into the consideration of ethical questions." The recognition of man's true place in Nature is the last and decisive blow at the mediæval-monastic system of life, and consequently at asceticism in its every manifestation.

Among the more special ethical consequences of Evolutionism must be reckoned a new code as regards our treatment of the lower animals. If we still, as a painful necessity, are compelled to sacrifice life to our safety and in the pursuit of knowledge, the time will assuredly come when we shall be ashamed of the very word "sport," as expressing the infliction of pain and death for amusement.

An ethical doctrine implicated is the so-called freedom of will—the assumption that the voluntary actions of mankind are not subject to the law of causality. The author shows that everything which endears to us the idea of liberty is in reality unaffected by philosophic determinism. It has repeatedly been pointed out in the "Journal of Science" that our right to eliminate beast or man dangerous to human society is all the stronger if the offender pleads necessity.

An important consequence of the doctrine of development is that well-being is recognised as the object of life, and that actions are considered good or evil in so far as they promote or frustrate this great end—a criterion substantially agreeing with that of Herbert Spencer. The author remarks that the fundamental error of eudæmonism or egotism raised to a system lies in its neglect of the sympathetic emotions which centre in others.

The last and perhaps the most important section, the relation of Evolutionism to religion, scarcely falls within our province. The author remarks that Natural Science is hostile to all teleology which views the "mechanism of Nature" as something foreign and external. It would be a lamentable contraction of our spiritual wealth if we renounced the part played by religion in life. But the author is convinced that the *gloria in excelsis* will resound through the ages so long as a human nerve quivers in response to the sublime.

We must here conclude our brief survey of this important treatise. We consider that the author has brought to his task learning equally wide and accurate, and that he has thrown a welcome light on some of the most complicated questions of the day. To quote the significant passages with which his pages are crowded would be to translate the work *in extenso*.

Conscious Matter, or the Physical and the Psychical universally in Causal Connection. By W. STEWART DUNCAN. London: D. Bogue.

WE have here a work which may, to a certain extent, be regarded as a continuation of two articles contributed by the author to the "Journal of Science" (1878, pp. 186 and 385).

Mr. Duncan undertakes to "remove certain barriers to the progress of Modern Psychology; to repel certain objections and to suggest a slight re-arrangement of its tenets, to enable it to harmonise with physical science." He informs us that the existence of a substantive entity, inhabiting the body of a living man, but distinct altogether from the matter of which such body is composed,—in other words, of a soul,—in which alone mental experience can arise, and from which alone volition proceeds, though widely held by metaphysicians, by the clergy, and the unscientific laity, "is almost, if not quite, universally rejected by experts in that department of biology which compares and describes the structures and functions of nervous organisation in man and the lower animals." In favour of this view he cites the published utterances of Mr. Douglas Spalding, of Professor Allman, of Drs. Maudsley and Bastian, of Prof. Bain, and even of Prof. St. George Mivart. Hence, according to the teachings of modern psychology, if correctly represented by these eminent men, "the immaterial soul, considered as a substance numerically and essentially distinct from that of which a material organism is composed, namely matter, is a non-entity, a mere myth."

Prof. Allman, however, points out a "weak point" in the generalisation which refers consciousness as well as life to a common material source, namely, that there is no analogy between mental and physical phenomena. "Even irritability," the Professor adds, "to which, on a superficial view, consciousness may seem related, is as absolutely distinct as it is from any of the ordinary phenomena of matter."

A second objection is drawn from the automatic or unconscious acts of men and animals, from which it has been inferred that "the physical processes in nerve-action were complete in themselves, without the necessary intervention of any mental action or condition." The third difficulty is to account for the persistence of the individual self, while the particles of matter of which it was said to be composed were believed to be continually passing out of the body and being replaced by new particles.

To these objections, then, Mr. Duncan addresses himself. He points out that the term "physical" has been used in three senses, implying "the play of forces, or the equilibrium of forces as such," considered apart from matter; secondly, it has been applied to matter by itself, apart from either force or feeling;

and thirdly, it is used of matter and force in union, as when we speak of moving bodies." There has been also an ambiguity in the terms "mind" or "mental," and hence has arisen a confusion in contrasting "mind with matter," so that it became doubtful wherein the relevancy of the antithesis consists. The author considers it as inconsistent to say "mind is opposed to matter" as to say "dynamics is opposed to matter." He holds the terms "objective" or "non-ego" as altogether out of court, and recognises in each living man, and therefore in all matter, two phases—the one *mental, conscious, feeling;* the other *active, energising, dynamical, physical.* Between these two phases or properties he then proceeds to point out analogies. To these we must especially invite the attention of the student, since, if they can be proved to be erroneous or counterbalanced by points of distinction, the author's attempt to bridge the chasm between physical and psychological science must be regarded as a failure. The first point of resemblance is that feeling and force are alike in themselves destitute of space extension. They are both, however, related to that which is extended, namely, matter. They may both be spoken of in the plural number. They have each the character of diversity applicable to them, and have each the quality of duration. They have each the quality of degree; they are respectively capable of being combined. Feelings and forces are transmutable into other feelings and forces. An equilibrating tendency and centralisation are characteristic of both feelings and forces. They are each measurable as to quantity or intensity. Lastly, force is often measured by its "companion property feeling, and feeling by its companion property force. The contrasts between feelings or forces, the author considers, are not greater than occur between two mental states.

In opposition to the well-known theory of "concomitance," which holds that molecular motions and states of consciousness are produced simultaneously, the author proposes the theory of "alternation." "The time of occurrence of the mental state is when any body, particle, or part of matter is in the attitude of receiving force."

In meeting possible objections to this new theory, the author is led to views on the constitution of matter which may possibly be deemed heretical. He holds that what we call "body" is merely a group of forces, more or less complex, in equilibrium. Motion he regards "not as really a translation of matter, but simply a translation of force-groups throughout continuous and universal matter." The human "Ego," the individual personality, he defines as "the psychical compound, the compound of feelings connected with every body, organic or inorganic." The so-called material change, so far from being opposed to the persistence of the Ego, is, rightly considered, necessary to such persistence. Mr. Duncan holds, however, that "with death each human Ego perishes." Observing how widely and increasingly

human immortality is denied by modern psychologists, we cannot help thinking that the demonstration of a continued existence of the individual after the phenomenon known as death would be the most splendid service which could be rendered to Science.

Those of our readers who wish for a further acquaintance with this little work, abounding as it does in matter worthy of the most serious study, will do well to re-peruse the author's two memoirs in the "Journal of Science" above referred to.

The Natural Conditions of Existence as they affect Animal Life. By KARL SEMPER, Professor of (? at) the University of Würzburg. London: C. Kegan Paul and Co.

THE original German edition of this interesting work has been made the subject of an article in our December number for last year. Hence we can say but little on the version now before us. The translator supplies a valuable note showing that, contrary to Prof. Semper's opinion, carbonic acid has been actually decomposed by green-coloured animals. But we dissent here from the author's reasoning; if a substance presents the elementary composition of chlorophyll, and displays the same chemical reactions and spectroscopic characters, we do not see that its ability or inability to decompose chlorophyll under the influence of sunlight is an essential question. That it possesses this property when forming part of the living vegetable tissue is scarcely a sufficient proof that the same result must be produced under very different circumstances. That chlorophyll acts as an organ in plants does not warrant us in concluding that its functions, if present in animals, must be the same.

As regards Mr. Buxton's interesting experiment of allowing tropical cockatoos to live in the open air in England, we must remark that the winter of 1867-68 was unusually mild, the greatest cold recorded by a thermometer fixed in the wood being only about 29° F. Such experiments, owing to the bird-murdering propensities of the British public, can only be attempted by the proprietors of extensive domains, and we share Prof. Semper's regret that on Mr. Buxton's death the observations were brought to an end. The facts already noticed warrant at least a supicion that many of the more splendid forms of animal life may have been extirpated in higher latitudes not so much by the direct action of cold as by the difficulty of finding, during the winter season, food and shelter from enemies.

In a note the author, referring to the question whether similar organic forms can be derived from independent parent-stocks,

speaks of "that extreme and dogmatic form of Darwinism which in Germany has been designated as Haeckelism." Between Profs. Haeckel and Semper there is, to use a homely old phrase, "no love lost." As instance we may refer to Prof. Semper's work, "Haeckelismus in der Zoologie" (Hamburg, 1876), and to the Preface to the third edition of Prof. Haeckel's "Evolution of Man," which may be consulted in the English version (London: C. Kegan Paul and Co., 1879). One bone of contention between these two authorities is, that whilst Prof. Haeckel seeks to derive the Vertebrates from the *Amphioxus*, Prof. Semper seeks their parentage among the Annelida. Indeed the mutual relations among the chiefs of the new school of Natural History in Germany are much less amicable than might be desired.

For our general estimate of the work before us the reader must be referred to our December number. We regret having to add that the translator has not always succeeded in rendering the original into idiomatic English. We read, *e.g.*, that *Nestor mirabilis*, of New Zealand, "sips the most minute wounds on a living sheep." Again, "Dr. Günther, *in* London, has lately made a remarkable attempt to explain," &c.: "*of* London" would be the customary English expression. These and other inaccuracies and inelegancies will, we trust, be corrected in any future edition.

We are, however, very glad to find that Prof. Semper's work has been made accessible to the many English naturalists who do not read German.

Report of the United States Geological Survey of the Territories
Vol. XII. Washington: Government Printing-Office.

This volume is devoted to Dr. Joseph Leidy's monograph of the Fresh-water Rhizopods of North America—a tribe of beings which, though exceedingly minute, are of high importance as being probably the starting-point of animal life in point of time, and as rock-formers are of unsurpassed importance in the economy of Nature. The author describes upwards of a hundred species. There are forty-seven plates, some of them containing as many as forty well-executed figures, mostly coloured. Prof. Leidy notes that the Rhizopods, like many other minute forms both of animal and vegetable life, though often abundant in the light superficial ooze at the bottom of still waters, never penetrate into the deep black mud, a medium unfavourable to organisms of every kind.

The thoroughness of this work makes us the more regret that it is mentioned as one of the "final" reports of the Survey,—

final, not because the task is completed, but because its operations are no longer to be conducted on the same magnificent scale.

Ideal Chemistry. A Lecture by Sir B. C. Brodie, Bart., D.C.L., F.R.S., Professor of Chemistry in the University of Oxford. London: Macmillan and Co.

Signal as have been the triumphs, in our times, of purely experimental science, they do not satisfy the cravings of the human mind. On all hands we perceive a disposition to forestall the results of an appeal to facts, and to outrun what has been demonstrated. In how far such anticipations may prove to be truthful foreshadowings of the future, or, on the contrary, in how far they may have to be rejected as mere *ignes fatui*, time alone can decide.

The great philosophic problem of chemistry is now the question of the elements. Are they really and in truth primordially distinct bodies? Are any of them compounds of the others, more intimate than those we are in the habit of decomposing, and recombining in our laboratories? Or are all of them resolvable into some more truly elemental elements, or even element of which we as yet know nothing? Are they the survivors of a process of natural selection, existing because in harmony with their surroundings? These and many more queries are put none the less eagerly because so far every key with which we try to unlock the mystery breaks in our hands. Sir B. C. Brodie suggests that "in remote time, or in remote space, there did exist formerly, or possibly do exist now, certain simpler forms of matter than we find on the surface of the globe." Of these bodies such elements as hydrogen and mercury are records remaining to us. He supposes that when the temperature of matter was much higher than it is now everything existed uncombined and in a gaseous state. As the temperature began to fall, combination set in; water and hydrochloric acid began to exist. The heat still decreasing, certain forms of matter became more permanent and stable, and when once formed could never be decomposed. All this may be supposed; but can it be proved? Does Prof. Brodie take even a step towards the required demonstration? We think not. As far as we are aware this lecture and the author's "Calculus of Chemical Operations" have not proved fruitful.

CORRESPONDENCE.

*** The Editor does not hold himself responsible for statements of facts or opinions expressed in Correspondence, or in Articles bearing the signature of their respective authors.

ANTI-VIVISECTIONIST LOGIC.

To the Editor of the Journal of Science.

SIR,—I beg to call your attention to the subjoined extract from the "Medical Press and Circular." The remark of the Rev. Mr. Fisher is a "cabinet specimen" of anti-vivisectionist argument. If the fact that "Life is God's gift to animals" is a valid plea against vivisection, it is equally cogent against the slaughter of animals for food and against the destruction of vermin.—I am, &c.,

ANTI-CANT.

"At the forty-first annual meeting of the Scottish Society for the Prevention of Cruelty to Animals, held last week in Edinburgh, Mr. Josiah Livingstone presiding, a report was submitted showing that a large amount of good had been accomplished by the Society's operations during the year, but that the expenditure had considerably exceeded the income. In the course of the proceedings a suggestion that the Society should direct their attention to the question of Vivisection was strongly opposed by Councillor Sloan, who declared that the saving of a single life was of more importance than the lives of all the cats and dogs put together. (Loud hissing, and cries of 'Shame.') He heard ladies hissing, but he said that a single human life was not to be compared to all the cats and dogs that are nursed and pampered in the New Town of Edinburgh. (Cries of 'Shame,' and the Rev. Mr. Fisher—'Life is God's gift to animals as well as to you.') He did not wish to sanction cruelty, but were the discoveries of scientific men like Dr. Keith and others to be baulked by mere sentiment? He was sorry to see people who, before they would give up pampered, wheezing brutes for scientific purposes, would rather give up their domestics. (Hissing, and great interruption.) The suggestion was ultimately agreed to, as were several others of a like character."

THE SOCIETY OF ARTS AND SANITARY MOVEMENTS.

To the Editor of the Journal of Science.

SIR,—Can you, or any of your correspondents, inform me whether the Society of Arts is, strictly speaking, keeping within the sphere of its duties and functions when it enters upon sanitary questions?—I am, &c.,

SUUM CUIQUE.

[We are unable to answer the difficult and delicate question raised by our correspondent. We should recommend him to take counsel's opinion on the Society's Charter of Incorporation.—ED. J. S.]

UNPLEASANT ALTERNATIVES,

To the Editor of the Journal of Science.

SIR,—The "unpleasant alternative" will be altogether avoided, and "Verifier" will be enlightened as to how the Indian juggler performs the trick, if he will apply to any conjuror.—I am, &c.,

SALTBURN.

NOTES.

M. E. Brandt has laid before the Academy of Sciences an account of his very elaborate researches on the nervous system of the different orders of insects. He has examined 235 species of Coleoptera in their perfect state, and 36 in the state of larvæ. He finds that in some (*Rhizotrogus solstitialis*) the subœsophagian ganglion is blended with the thoracic. The cerebral ganglia have always convolutions. There are from one to three thoracic ganglia. The abdominal ganglia vary from one to eight, the number varying sometimes in the two sexes of the same species. Sometimes, as in the Curculionides and Lamellicornes, there are no distinct abdominal ganglia, but they are blended with the thoracic portion. The author's results on the nervous system of the Hymenoptera were published in the "Comptes Rendus" (lxxxiii., p. 612). All the Lepidoptera have two cephalic ganglia, the upper one having convolutions. There are always four abdominal ganglia, save in *Hepialus humuli*, where there are five. The Diptera have always two distinct cephalic ganglia, the upper being convoluted. The thoracic ganglia vary from one to three, and the abdominal from one to eight, the number sometimes varying according to sex. Sometimes also the abdominal and thoracic ganglia are blended. In the Hemiptera the subœsophagian ganglion is sometimes placed in the thorax: they have never distinct abdominal ganglia.

MM. Garreau and Machelart have extracted from plants of the Saxifrage group an alkaloid which they name benzonine, and which in its physiological action has some resemblance to quinine.

Mr. S. H. Scudder has produced a memoir on the fossil insects from the Devonian of New Brunswick. We make the following extracts from the report given by the "American Naturalist:"—The general type of wing-structure has remained unaltered from the earliest times. Three of these insects (*Gerephemera*, *Homothetus*, and *Xenoneura*) have a neuration differing both from the carboniferous and the modern types. The earliest insects were all hexapod, all hetero-metabolous, and all allied to the Neuroptera. They show marks of affinity to the carboniferous Palæodictyoptera, but are often more complex in structure. They differ remarkably from all other known types, ancient or modern, and some of them appear more complicated than their nearest living allies. While there are some forms which bear out expectations based on the general derivative hypothesis of structural development, there

are others quite unexpected, and not to be explained by that theory without involving suppositions for which no facts can at present be adduced.

Dr. Merriman, writing in "Science," declares—"I believe in the fact of the gradual development of the organic kingdoms; for all Science teaches it. But I believe it was governed and guided by forces more potent than accident or chance. The Being, or first cause, if you will, that originated the simple elements of matter, and endowed them with the power and the tendency to aggregate into developing worlds, might equally as well have endowed certain of them with the power and the tendency to aggregate into ever-advancing organisms."

Dr. Burrill, in a communication to the American Association for the Advancement of Science, pronounces the "fire-blight" of the pear tree and "twig-blight" of the apple due to an organism similar to, if not identical with, the butyric vibrios of Pasteur and the *Bacillus amylobacter* of Van Tieghem.

It is not generally known that the father of the celebrated chemist Chevreul reached the age of 110 years.

The "American Journal of Microscopy" reports a valuable memoir on "Blood-stains as Evidence in Criminal Cases," read before the St. Louis Medico-Chirurgical Association, by Dr. C. O. Curtman. The author shows that the popular notion of the discrimination of human blood from that of other Mammalia by microscopic and spectroscopic evidence is erroneous. The blood-discs of the dog approach so nearly in size and shape to those of man that they cannot be discriminated with certainty, even when fresh. Blood-corpuscles taken from a mosquito up to forty-eight hours after imbibition could be easily recognised. In the body of the bed-bug blood is destroyed much more rapidly.

Dr. E. L. Trouessart defends the theory of Evolution in the "Revue Scientifique" for October, 1880. He contends that transformations have occurred more rapidly under certain circumstances than under others, and that the changes may have occurred during embryonic life. He refers to the writings of Selys-Longchamp on "Saltatory Evolution."

According to a memoir by Prof. Virchow, which appears in the "Medical Times," medical literature affords examples of a true external tail in the human species, resulting from a prolongation of the spinal column. One of these cases, examined by Dr. Ornstein, Surgeon-in-Chief of the Greek Army, was 5 centimetres in length, whilst another, examined by Virchow himself, reached the length of 7½ centimetres.

According to Prof. Bouchardat, of the Faculté de Medecine, the vine is a powerful sanitary agent. Wherever it is largely cultivated the effluvia which give rise to intermittents disappear.

Mr. H. H. Howorth, in the "Geological Magazine" for December, 1880, argues that, at the epoch of the mammoth, Siberia enjoyed a climate not indeed tropical, but very much milder than is experienced at present.

Prof. Issol, writing in the same journal, shows that the Galita Islands, to the north of Turin, are a prolongation of the granitic mountains of Sardinia.

Mr. Melvin, in a paper read before the Geological Society of Edinburgh, calls attention to the evidence supplied by the vegetable soil as to geological time. He considers that the state of the earth's surface supplies no proof that the arable mould in one hemisphere is older than in the other.

Mr. D. Milne-Home, in his valedictory address to the same Society, stated that in all branches of Natural History, save in Geology, the field for discovery in Great Britain will soon have been thoroughly exhausted.

The "American Naturalist" quotes the Rev. R. B. Watson as stating that there are molluscous species whose distribution is cosmopolitan, and in which no traces of essential, lasting, and progressive change are to be found.

Prof. A. Hyatt, at the last meeting of the American Association for the Advancement of Science, gave a lecture on the transformation of *Planorbis* as illustrative of the evolution of species. The lecturer denied that the Darwinian hypothesis is supported by all naturalists who accept Evolution, and pointed out that it cannot be the primary cause of the variations.

The "American Naturalist" of December, 1880, has a valuable paper on the "Extinct Cats of America," by E. D. Cope, and a continuation of Mr. C. Sedgwick Minot's "Sketch of Comparative Embryology," in which he expounds the general principles of development.

In Brooklyn a man died from the effects of eating trichinised ham, and his widow sued the vendors for damages. The judge raised the question whether it was an ordinary custom to eat raw meat, and whether provision-merchants were bound to supply ham fit to be consumed in such a manner? At the trial Mr. Atwood stated that he had detected trichinæ in the flesh of poultry. Oxen obtain trichinæ from infected water and from grass manured with slaughter-house refuse. The "American Journal of Microscopy" rightly thinks that there is no safety except in the disuse of underdone meat.

M. A. Milne-Edwards has laid before the Academy of Sciences a report on the animals collected on the eastern coast of Madagascar by M. Humblot. He has brought over a pair of living aye-ayes, a species interesting as connecting the lemurs with the rodents.

MM. J. Macé and W. Nicati communicate to the "Comptes Rendus" the results of their researches on colour-blindness. In some cases they find the perception of red deficient, that of yellow normal, and that of green more acute than in the healthy eye. In others the perception of red is abnormally acute; that of yellow, blue, and violet normal, but that of green enfeebled. Hence the authors reject the theory of Hering, who assumes the presence of two distinct photo-chemical substances in the eye, the one serving for the perception of red and green, and the other of yellow and blue. They consider that there are in the retina three photo-chemical substances, corresponding to the three fundamental colours of Young and Maxwell—*i.e.*, red, green, and violet.

M. Lichtenstein reports, to the Academy of Sciences, on the *Phylloxera*. He thinks the insect-enemies of this invader not sufficiently numerous to be of great value. He is engaged with experiments on certain insecticide Fungi, such as *Empusa muscæ*, but the results as yet are not decisive.

M. S. Jourdain considers the inner pair of antennæ in certain Crustacea as undoubtedly organs of sensation, but in default of special experimentation he does not feel justified in pronouncing them the seat of smell.

According to M. H. Viallanes ("Comptes Rendus") there exists under the hypoderm of insects a very rich plexus of ganglionic cellules, connected with the nervous centres, and giving off sensitive terminal nerve-ramifications.

Visibility of Minute Objects.—Prof. Abbe recommends monobromide of naphthaline for mounting diatoms as less inconvenient than the substances used by Mr. J. W. Stephenson (bisulphide carbon, with or without phosphorus, or sulphur in solution). The liquid is colourless and oleaginous, with the odour of naphthaline. It is soluble in alcohol and ether, and has a density of 1·555, with a refractive index of 1·658, giving therefore, as the "index of visibility," 22 as against 11 for Canada balsam. It is not volatile. The cover glass should be run round with a ring of wax; then with a cement of isinglass dissolved in spirit, or Canada balsam, rather thick, dissolved in chloroform; finally closing with a solution of shellac.

The following preservative fluid is given in the "American Journal of Microscopy" (vol. v., pp. 185, 186):—Two parts of salicylic acid and one part of borax, dissolved in a sufficient quantity of glycerin, and diluted as the nature of the tissue to be preserved may require. Preparations so mounted are said to be very durable, and there is no danger of the salts crystallising out and spoiling the object.